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14. ABSTRACT
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with an introductory chapter asking the stated question in context, presenting the methodology used, and summarizing the proposals given at the end of the treatment. The methodological approach to this thesis involves historical and literature reviews, interviews, and a qualitative comparison of current and proposed weapons systems, capabilities, and doctrine. Broad strategic options, not specific tactical systems, are the focus of this study. The second chapter reviews milestones of missile and anti-missile, diplomatic, and political history to establish a basis for how we arrived at the present situation. Next, the third chapter reviews the current theater ballistic missile (TBM) and weapons of mass destruction (WMD) threat situation. Also, an overview of contemporary political and military reasoning is presented to provide a baseline of support for the critical need of an integrated joint and multi-layered TMD. The fourth chapter compares current and near-term Anti-Missile systems and programs, identifies a near-term Anti-Missile Capabilities Gap, and distills the plethora of situational information to four succinct implications. Finally, the last chapter provides and analyzes four proposals for possible actions that the USAF can take to answer the thesis question while taking into account the implications of the current and near-term TBM situation. Overall, this thesis recommends a philosophical shift to one in which USAF near-term Attack Operations (AO) and BMC4I integration are considered as part of an air and space power Anti-Missile Offensive Counterair effort, not simply an adjunct to a ground-force driven TMD paradigm. Jointly, this could portend a new Anti-Missile Offensive Action pillar to buttress the currently defensively oriented Joint TMD concept. Tailored Air Expeditionary Forces (AEFs), USAF Anti-Missile centralized control, improved USAF AO and BMC4I capabilities, and doctrinal changes are proposed as options to improve the US strategic vulnerability to TBMs and WMD while reducing the impact of the current and near-term Anti-Missile Capabilities Gap.

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FROM THEATER MISSILE DEFENSE

TO ANTI-MISSILE OFFENSIVE ACTIONS:

A NEAR-TERM STRATEGIC APPROACH FOR THE USAF

BY

MAJOR MERRICK E. KRAUSE

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About The Author

Major Merrick E. Krause was commissioned through the United States Air Force Academy in 1984. Graduating from Euro-NATO Undergraduate Pilot Training in 1985, he went on to fly F-4Es as an aircraft commander and flight leader, first at Moody AFB, George then Seymour Johnson AFB, North Carolina. During the conversion of the first operational F-15E "Strike Eagle" Wing, Maj. Krause was selected to transition to fly the F-15E. He subsequently served as an F-15E instructor and evaluator pilot for the 4th Tactical Fighter Wing (TFW) at Seymour Johnson AFB. During Operations Desert Shield, Storm, and Resolve, Maj. Krause was a mission commander credited with 52 combat sorties, accumulating well over 100 combat and combat support missions in the South West Asia (SWA) theater. In 1991, he also served as acting chief of Wing Standards and Evaluations, 4404 TFW (P), Al Karj and Dhahran, Saudi Arabia. In 1992, Maj. Krause attended the USAF Fighter Weapons School and served a test project officer, Chief of Weapons, Strike Eagle Test Flight Commander, and as an instructor and evaluator pilot in the 57th WG, Air Warfare Center (AWC), at Nellis AFB, Nevada. Major Krause is a senior pilot with over 2800 flying hours and 216 combat hours. He has a bachelor's of science degree in Psychology from the US Air Force Academy, a master's degree in Aviation Science and Operations from Embry-Riddle Aeronautical University, and a master's degree in Air Power Studies from the USAF School of Advanced Air

Power Studies. In June 1998, Major Krause was assigned as a campaign planner at Checkmate, AF XOOC, at the Pentagon.

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I want to thank my advisor, LTC Clay Chun. His patience and guidance were critical factors in this effort and in my entire SAAS experience. I would also like to thank LTC Dave Coulliette and Maj. Roy Houchin. Their insights on technology and space were most helpful. Furthermore, Dr. Carl Mueller provided me with the impetus for future studies in deterrence theory and non-proliferation considerations. His perspicacity on these political efforts encouraged me to successfully war-game the WMD deterrence and anti-missile concepts contained or alluded to in this thesis. This war-game was a SAAS (plus SAMS/SAWS/NWC) graduation exercise simulating a complicated high-threat theater missile and weapons of mass destruction environment set early in the next century. I also certainly thank Col. Robert Owen, Dean of SAAS, for his mentorship, sagacity, and time—and for allowing me to apply some of my theories and leadership skills in a dynamic war-game across a global theater of operations.

Finally, I want to express my sincere appreciation to my wife, Shari, for her love and understanding during those times when I was absent in spirit, struggling with this thesis or just thinking mildly deep thoughts. Her confidence and support remains very important to me and made all the difference in ensuring my success in completing this work.

Abstract

This study examines the question: "What strategic approach *should* the USAF take toward Theater Missile Defense (TMD) and Anti-Missile Offensive Actions in the near-term?" The thesis begins with an introductory chapter asking the stated question in context, presenting the methodology used, and summarizing the proposals given at the end of the treatment. The methodological approach to this thesis involves historical and literature reviews, interviews, and a qualitative comparison of current and proposed weapons systems, capabilities, and doctrine. Broad strategic options, not specific tactical systems, are the focus of this study.

The second chapter reviews milestones of missile and anti-missile, diplomatic, and political history to establish a basis for how we arrived at the present situation. Next, the third chapter reviews the current theater ballistic missile (TBM) and weapons of mass destruction (WMD) threat situation. Also, an overview of contemporary political and military reasoning is presented to provide a baseline of support for the critical need of an integrated joint and multi-layered TMD. The fourth chapter compares current and near-term Anti-Missile systems and programs, identifies a near-term Anti-Missile Capabilities Gap, and distills the plethora of situational information to four succinct implications. Finally, the last chapter provides and analyzes four proposals for possible actions that the USAF can take to answer the thesis question while taking into account the implications of the current and near-term TBM situation.

Overall, this thesis recommends a philosophical shift to one in which USAF near-term Attack Operations (AO) and BMC4I integration are considered as part of an air and space power Anti-Missile Offensive Counterair effort, not simply an adjunct to a

ground-force driven TMD paradigm. Jointly, this could portend a new Anti-Missile Offensive Action pillar to buttress the currently defensively oriented Joint TMD concept. Tailored Air Expeditionary Forces (AEFs), USAF Anti-Missile centralized control, improved USAF AO and BMC4I capabilities, and doctrinal changes are proposed as options to improve the US strategic vulnerability to TBMs and WMD while reducing the impact of the current and near-term Anti-Missile Capabilities Gap.

Preface

This preliminary note is intended to help the reader understand the motivation and direction this research project followed. This treatment began as an investigation into the *long-term* strategic approach of the USAF toward Theater Missile Defense (TMD). After my first few hundred hours of research, however, it changed to a more determined study of a *near-term* USAF strategic approach to Anti-Missile Offensive Actions.

My interest in Anti-Missile Actions grew out of my participation as a flight-leader of many hours of "Scud Hunting" missions over Iraq during Desert Storm as well as later producing the tactics for several associated tests at Nellis AFB, with the 57th Test Group. As an operator, I understood that my experience was limited to employment and not the strategy development that led to the necessity for the missions and tests in which I was involved. Therefore, I tried to enter this research with an open mind and long-term vision to investigate USAF strategy.

Two fundamental concerns surfaced as I digested my research materials. First, it became evident to me that there was a definite Anti-Missile Capabilities Gap for the US military existing now and remaining until at least the middle of the first decade of the next century. Second, our current Joint Theater Missile Defense lexicon addressed air and space power tangentially—relegating an inherently offensive USAF capability to an adjunct status for a strategically critical mission jointly promulgated as "defensive." Because of my concern over the Anti-Missile Capabilities Gap and my perception that

theater ballistic missiles were weapons of strategic importance, I shifted the focus of my research from twenty years in the future to today and the next seven years. Instead of the USAF long-term vision, which generally appears well conceived, this study examines the question: "What strategic approach *should* the USAF take toward TMD and Anti-Missile Offensive Actions in the near-term?"

I hope, perhaps, that my humbly submitted implications and propositions spur further discussion of the subject of USAF Anti-Missile Offensive Actions. I expect we, as a nation, shall again be confronted with theater ballistic missiles and weapons of mass destruction (WMD) sooner rather than later. Moreover, I certainly believe that a good USAF Anti-Missile plan *now* is better than a perfect plan presented one day too late—the morning after an enemy missile, armed with a WMD agent, explodes in a friendly nation's capital or among our troops in the field.

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Chapter 1

Introduction

Offense is the essence of air power.

General "Hap" Arnold

Now, the bulk of the money is going to the Army and Navy to develop several different systems for terminal defense against ballistic missiles. I call this the catcher's mitt approach. Other than to provide early warning and command and control, we have not sought an Air Force role in this part of the TMD equation.

Gen. Ronald Fogleman

The Air Force Role in Theater Ballistic Missile Defense

The 1991 Gulf War produced a radical change in the relative importance of the theater ballistic missile (TBM) threat. TBMs, regarded by many military leaders as merely a tactical nuisance when not carrying weapons of mass destruction (WMD), suddenly became weapons of terror with the potential for disproportionate political and diplomatic ramifications. Though US deterrence appears to have persuaded the Iraqi government to refrain from employing WMDs, conventionally equipped Scuds created a political crisis for the Coalition when Iraq attacked Israel with Scuds. A single conventionally armed Scud also produced the greatest number of US fatalities of any single event during the Desert Storm when it struck a barracks in Dhahran. Throughout the Gulf War, hundreds of sorties and thousands of man-hours were devoted to

countering the Scud threat with less than optimum equipment and training. As a result, the Coalition lost the use of those resources that could have attacked other targets, destroyed suspected WMD production and storage facilities, and ultimately may have forced a more rapid conclusion to the Gulf War. Because of the experiences of that conflict, the US has crossed the missile defense Rubicon and the services are now well committed to defeating future missile threats.

Today, the US Army, Navy, and Air Force have collectively spent billions of dollars developing systems to defeat future theater ballistic missile threats under the collective moniker: theater missile defense (TMD).[1] However, there is frequent overlap between the systems of the individual services and current systems typically used for other military activities. The Ballistic Missile Defense Organization (BMDO), Joint Theater Air and Missile Defense Organization (JTAMDO), and various service entities currently work in cooperation on a variety of systems—a Family of Systems (FoS)—to defeat ballistic missiles.[2] Yet, differences remain in the concepts of employment based on service histories and traditional roles. As the US government allocates funds for missile defense, any selected architecture should be efficient, economical, and provide the best possible overlapping defensive structure possible, for political, military, and humanitarian reasons.

In an attempt to place the bottom line as close to the front as reasonable, this thesis examines several concerns. First, it appears that the Department of Defense (DoD)

[1] "Ballistic Missile Defense FY 96-FY 98 Appropriations Funding," BMDO, on-line, Internet, 19 Nov 97, available from http://www.acq.osd.mil/bmdo/bmdolink/pdf/budget.pdf. Additionally, multiple sources confirm the specific amounts spent on the various missile defense systems, studies, and research programs. This source is a good, brief summary of specific BMDO projects broken-down into Procurement, RST&E and MILCON.

currently has several programs in the works for future long-term area-wide TMD. But, the one option that actually appears to work *now* is Attack Operations (AO). Furthermore, AO can be improved in the near-term with the minimal infrastructure changes and developmental costs.[3] However, AO currently receives the least funding and attention of all the TMD FoS.

Second, there is no single commander in control over all of the architecture—including all the necessary systems to overlap each phase of a ballistic missile attack.[4] Third, conceptual, developmental, and integrating duties are divided between numerous organizations and services. Additionally, though the Army Theater High Altitude Area Defense (THAAD), Navy Upper Tier, and Navy Lower Tier are laudable programs, they derive a disproportionate piece of the TMD budget for systems that have yet to successfully function. The Patriot is a fair point defense weapon, but provides no area defense capability—and it suffers from the drawback of raining deadly debris on friendly territory. The USAF Airborne Laser is an intriguing concept for the future, but too few are planned for production for effective coverage in two simultaneous major regional conflicts (MRC).

Finally, the high political and strategic priority given to TMD is starkly contrasted by the limited emphasis on developing AO. Indeed, creative adaptations to deal with the ballistic missile threat in the near-term are needed before the more recondite systems become available, and to supplement them once new systems are operational. The

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[2] Family of Systems (FoS) is the BMDO preferred term to describe the multi-layered architecture of planned TMD systems.

[3] Near-term, for this thesis, refers to period from the present to approximately 2005. Mid-term is the 2010 timeframe. Long-term is beyond that.

integration of both offensive and defensive systems is required to provide a truly multi-layered and coordinated Anti-Missile and TMD capability.

This treatment investigates the overall question: "What strategic approach *should* the USAF take toward TMD and Anti-Missile Offensive Actions in the near-term?" Necessarily, a strategic approach must take into account the existing USAF paradigm of the employment of air power. In addition, the integration of space power is a consideration. This thesis will present some fundamental groundwork toward a theory of USAF use of air and space power in a TMD and WMD environment. Once leaders agree on a preferred USAF TMD, or Anti-Missile strategy, there is the need to avoid a dogmatic approach to allow doctrine to evolve as technology improves in the future. Nevertheless, the USAF strategic approach should rely on an extension of the current vision of USAF Offensive Counterair (OCA), Aerial Interdiction (AI), and Strategic Attack (SA) operations, the envisioned role of air and space power, and the predicted nature of air and space power relating to the threat of the future.

There are several reasons the topic of a USAF Anti-Missile strategy is important to research. First, there are future force structure issues to consider, including what to buy, how much, and how best to organize and train those forces. Second, since TMD occurs in a joint environment, a synergistic effect is the most productive and is definitely a goal. This author certainly does not dispute the necessity for multiple layers of systems in an integrated TMD architecture. However, reliance on terminal defensive systems, point defense, or simply "catcher's mitt" systems is sheer folly—particularly when the USAF and joint DoD air and space power can provide more options. Consequentially, ranking

[4] The phases are the Pre-launch, Boost, Mid-course, and Terminal. These will be

prominently among those currently available and desirable Anti-Missile options is Attack Operations.

Third, the nature of future enemy threats is important in the development of a strategy. Fourth, the issue of one-mission-only versus multi-purpose weapons systems becomes important for cost and flexibility. Fifth, the underlying traditional US vision of air power, that air power is offensive by nature, grounds our current and future strategies of air operations and is a prominent part of USAF doctrine—but offensive attacks against TBMs on the ground is considered theater missile *defense* in the Joint paradigm.

This thesis will examine these issues and more to produce proposals, recommendations and considerations. This discussion will contribute toward the development of a USAF theory for the use of air and space power in the near-term when operating in a TBM environment. Moreover, the proposals mentioned at the end of this chapter and detailed in the last chapter of this thesis present some solutions to shape that environment to facilitate victory within the evolving US air and space power paradigm.

Methodology

The methodological approach to this thesis involves historical and literature reviews, interviews, and a qualitative comparison of current and proposed weapons systems, capabilities, and doctrine. Generally, broad near-term strategic options are the goal of this study. Historical case studies produce the basis of the background section, Chapter 2. Operation CROSSBOW and "The Great Scud Hunt" are examples of important milestones in USAF Anti-Missile strategic option development. This historical review will briefly explore some key events and policies between Operation CROSSBOW and

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discussed later in Chapters 3 and 4 of this treatment.

today. Overall, the goal of this section is to explore "where we have been" to "where we are now."

A strategic policy review follows in Chapter 3. BMDO, JTAMDO, USN, USA, and USAF TMD paradigms produce the core information for comparison and contrast. Joint publications, service doctrine manuals, Congressional reports, personal interviews and unclassified articles provide the components of each service's policy paradigm. Minimal discussion of the details of each weapons system comprises the analysis section. This chapter also includes interviews of and briefings by analysts, specialists, and USAF leaders to assist in determining the extent of the theater missile defense problem and the options to respond to this threat.

Chapter 4 provides a detailed comparison of selected near-term systems introduced in Chapter 3. The goal of this Chapter is to determine what the implications are of the current TBM problem and the present and near-term Anti-Missile capabilities gap. A comparison of systems options with respect to qualitative capabilities, requirements, and limiting factors is included. Some essential discussion points are range, logistics support required, cost, multi-mission capability, opportunity costs, environmental feasibility, limitations, and joint environment functionality. Moreover, the Air Force tradition of offense and battle space management versus the "catcher's mitt" [5] approach is considered as an alternative effects based approach. Four implications of the

[5] General Ronald R. Fogleman, "The Air Force Role in Theater Ballistic Missile Defense," remarks delivered to the American Defense Preparedness Association/National University Foundation Breakfast Seminar Series on Missile Defense, Counter Proliferation, and Arms Control, Washington, DC, 16 June 1995. The General's use of the term "catcher's mitt" is not pejorative, merely descriptive. The author uses this term throughout to describe primarily terminal, but generally defensive, single mission Anti-Missile systems.

availability and qualitative effectiveness of the current joint TMD environment conclude this chapter.

After the analysis of the near-term program options, given that TMD remains a national priority, four options for a reinvigorated USAF Anti-Missile strategy are proposed in the last chapter of this treatment. The fundamental question this chapter seeks to explore is: "What strategic approach *should* the USAF take toward TMD and Anti-Missile Offensive Actions in the near-term?" To arrive at that answer, proposals are presented and analyzed with respect to the intermediate questions: "What can the Air Force bring to the fight, and what optimizes the chance for success with the minimum cost and vulnerability?" The proposals are related to the implications presented in Chapter 4 and examined with respect to qualitative projections. Additionally, implications of the various decision options are considered in forming the proposals and reflected in the Pros and Cons of each proposal.

Summary

The goal of this thesis is to investigate the question: "What strategic approach *should* the USAF take toward TMD and Anti-Missile Offensive Actions in the near-term?" As a result, this thesis presents proposals to address the implications derived from the analysis of USAF anti-missile options. Hopefully, these proposals will generate some discussion to advance the USAF anti-ballistic (and anti-cruise missile) programs. In fact, discussion may find that separating anti-missile programs from time-critical-target (TCT) concepts is not tenable. Moreover, integration of all elements of BMC4I, including information and space operations, should be included in any USAF future paradigm. Briefly, the four proposals presented in this treatment include:

Establish an Anti-Missile/WMD AO AEG capability.

1. Establish a single USAF leader for oversight of all Anti-Missile/WMD force planning, programming, and integrating—a USAF Anti-Missile Czar.

2. Continuing with all layers of the multi-layered joint TMD plan, the USAF should emphasize improving and employing AO in the near-term.

Change joint doctrine to reflect that AO is typically a Counterair OCA mission with excursions into AI and SA. This should include the overarching concept that Anti-Missile Actions (AMA) are more than TMD; AMA include offensive actions, defensive actions, and BMC4I activities.

Theater missile and WMD proliferation creates a new set of challenges for the USAF in this multipolar, post-Cold War world. Once improved, AO and BMC4I will effectively project national will, power, and protect our troops and allies with a strong offensive capability in a variety of situations. The implications and proposals presented in this treatment are a limited view of a complicated series of debates. But the question of how the USAF should best prepare for near-term TBM and WMD threats is both politically and militarily consequential. Any implications and proposals contained in this treatment are, in this author's opinion, necessary—but they may not be sufficient. Moreover, effects-based integration of OCA, AI, and SA provides a synergy of effects beyond the capabilities of the best defensive only single mission TMD system. Indeed, only quick action to advance USAF BMC4I and AO Anti-Missile capabilities combined with a multi-layer plan for active and passive TMD led by a concerted diplomatic non-proliferation effort will allow the US to navigate the next few critical years of international post-Cold War reorganization.

Chapter 2

Background

Soldiers usually are close students of tactics, but rarely are they students of strategy and practically never of war.

Bernard Brodie

There are two overt functions of ballistic missiles: to create fear and to destroy objects or people. Historically, the importance of the former to the populace of democracies and the potential of the latter to the civilian and military leaders are the mechanisms that create the necessity to provide some defense from ballistic missiles. Indeed, these very mechanisms and the relative ease with which a nation can affect terror with cheap and available technology, create strong incentives for third world countries to employ missiles to leverage larger and stronger forces. Moreover, cheap and available technology allows proliferation of TBMs and WMD to continue unabated.

TBMs are merely a subset of the greater ballistic missile threat. With regard to the function of the theater ballistic missiles, based on current threats, these missiles are judged more of a threat overseas than to the continental United States—though this may change.[6] In a given theater, terror may still be employed as a mechanism for coercion

[6] BMDO Fact Sheet, *Ballistic Missiles and the World Security Environment*, available on-line at http://www.acq.osd.mil/bmdo/bmdolink, 12 January 1998.

with the use of inaccurate TBMs. With the inclusion of weapons of mass destruction (WMD), small enemies can produce strategic effects against US, NATO, and UN forces.

The current Air Force paradigm for dealing with missile defense generally differs from the focus of most US Navy, Army and Marine Corps concepts. The essential difference is one of culture and philosophy. Based on the traditionally offensive nature of air power compared to the traditional surface force preoccupation with obtaining the security of their forces through defensive means, service technology and doctrinal approaches differ with respect to how missile defense is visualized, architecturally constructed, and in the inherent philosophy of missile defense.

Traditionally, the Air Force prefers to strike enemy threats preemptively, given the offensive nature of bombers, while the surface forces tend to concentrate on self-protection through defensive measures. This may demonstrate a simple difference of opinion between defensive and offensive strategies based on the USAF legacy of Douhet, Mitchell, the Air Corps Tactical School (ACTS), and the Combined Bomber Offensive (CBO). This offensive strategy can produce area-wide defensive results. However, as billions of dollars are spent designing a theater missile defense system, it is interesting to note that the preponderance of the monies allocated to theater missile defense, and the BMDO, go toward defensive "catcher's mitt" systems which are typically more point defensive systems. This relegates offensive systems, designed to exploit the advantages of air power, particularly, speed, range, rapid coordination, and flexibility, to a less funded and minimally promoted position.

The intent of this chapter is to answer the question: What are the historical steps that have led toward the current US Joint TMD posture? This chapter explores these questions

through a brief historical accounting of the development of key missile defense systems and philosophies.

Operation CROSSBOW

Zeppelins and Gotha bombers graphically introduced aerial terror bombardment to the "civilized" nations in Europe in WWI. As early as 1915, inventors in the US were experimenting with the idea of a "flying bomb," testing a prototype device in mid-1916.[7] However, WWII saw the first massive employment of systems similar to today's missile threat: the German V-1 and V-2. Operation CROSSBOW was the substantial Allied response to the German missile threat in the European theater. Between August 1943 and March 1945, the US Army Air Forces (AAF) and Royal Air Force (RAF) flew 68,913 sorties and expended 122,133 tons of ordnance in the campaign to destroy German missiles.[8] Indeed, Operation Crossbow was a large-scale counter-air operation that caused a substantial diversion of both tactical and strategic aircraft to both delay the V-weapon attacks and limit their effects once the Germans began employing the weapons.[9]

There are two points of view to consider regarding the V-weapons in WWII: military and political. First, militarily, it was not apparent what effects the Germans wished to achieve through launching the V-weapons. The military effects that Allied leaders envisioned included a delay of Overlord, disruption of the landing and invasion, slow the

[7] Kenneth P. Warrell, *The Evolution of the Cruise Missile*, (Maxwell AFB, Alabama: Air University Press, September1985), 7. Warrell provides a good historical development of the cruise missile concept in his well-referenced book. Peter C. Hewitt is cited with approaching Elmer C. Sperry with the "flying bomb" idea in 1915. This is recorded in a report by Bion J. Arnold to the Secretary of War, "Secret Report on Automatic Carriers, Flying Bombs (FB), Aerial Torpedoes (AT)," 31 January 1919 (AUL-623.451 W253B).

[8] United States Strategic Bombing Survey (USSBS), vol. 60, (Washington D.C.: Military Analysis Division, 1945), 26-27.

CBO against the German homeland, and lead to a relaxation of the Casablanca directive of unconditional surrender.[10] Through the German V-weapon threat was identified and realized, military intelligence was not up to the task of effectively finding and destroying all the V-1 and V-2 sites and their respective production and storage facilities due to command, control, communications, and intelligence deficiencies (C3I). Though many V-1 launch sites were destroyed and some scientists were killed, the overall effectiveness of the allied attacks were limited as thousands of V-weapons were launched.[11] Moreover, the potential for destruction of the V-weapons was viewed as more important than their actual capability. General Dwight Eisenhower noted that if the Germans were more successful in maturing their V-weapon capability six months earlier, then the allied invasion would have been "exceedingly difficult, perhaps impossible…."[12]

On the political front, Winston Churchill clearly recognized the threat to his country in late 1942 and early 1943. Military intelligence reports also alluded to the possibility of WMD weapons being launched on missiles against Britain. Churchill created a panel to investigate and make recommendations about the German V-weapons' potential. The potential of WMD armed missiles striking Britain added political concerns and urgency to the military calculus to increase both offensive and defensive countermeasures for self-

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[9] USSBS, *V-Weapon (Crossbow) Campaign*, 4.

[10] Wesley Frank Craven and James Lea Cate, eds., the Army Air Forces in World War II, vol. 3, Europe: Argument to V-E Day (Chicago: University of Chicago Press, 1951), 85.

[11] USSBS, vol. 2, 88 and vol. 60, 5. In *The Evolution of the Cruise Missile*, 60-1, Warrell reports that the Germans fired 10,492 V-1s against Britain and up to another 9,000 against targets on the continent. He cites the USSBS, Aircraft Factory Division Report, 115, (AFSHRC-137.302-3) when he notes that the Germans built approximately 30,000 V-1s with 60,000 planned.

[12] General Dwight D. Eisenhower, *Crusade* (New York: Doubleday, 1948), 260.

protection.[13] These measures included aerial bombardment attacks and increased home defenses (particularly anti-aircraft artillery and night interceptors). Finally, the impact of terror weapons on national morale and the public pressure on both political and military leaders were indirect effects of the V-weapons.

Technologically, the V-weapons were primitive; they were inaccurate and carried a light payload. Conversely, the Allied response to the V-weapons was strategic interdiction of the launch sites, storage, and production facilities, radar acquisition and ground control intercept (GCI) vectoring of fighters to shoot down the small-aircraft like V-1s in flight, and AAA as a defense of last resort to destroy incoming missiles. The Germans recognized their launcher's vulnerability, particularly after 25,150 attack sorties, with a cost of 154 allied aircraft and 771 crew members between 1 December 1943 and 12 June 1944.[14] A cat-and-mouse game continued as allied aircraft hunted camouflaged or concealed launch sites with binoculars and limited pre-mission intelligence. Between 12 June and 3 September 1944, another 26,000 Allied sorties were flown with limited effectiveness against the V weapons.[15]

Because of a faster, higher ballistic missile profile, V-2s were more difficult to locate and destroy. Between September 1944 and March 1945, more than 2,500 V-2s killed thousands in Britain and on the continent.[16] Indeed, many British civilians were terrified

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[13] Lt. Col. Mark Kipphut, *Theater Missile Defense: Reflections for the Future*, available on-line, *Air Chronicles*, 3.

[14] Warrell, 44. Numerous sources also provide similar statistics. Regardless of the exact number of sorties, it is obvious that a considerable effort was expended in attacking German V-weapon launch sites in CROSSBOW.

[15] Ibid., 49.

[16] *The Proliferation Primer*, (Washington D.C.: Committee of Governmental Affairs, United States Senate, January 1998), 57.

by the lack of warning for the V-2, though the V-1s caused more fatalities.[17] Apparently, the only attack option the Allies pursued that caused effects on the V-2 program was the attack on the German transportation system.[18] Though they were not successful in stopping the casualties due to the V-weapons, Crossbow did slow the introduction of the V-1 and V-2 by three to six months, making it a qualified success.[19]

Emerging USAF Missile Defense Roles

The need to define missile roles between the Air Force and its parent, the Army, emerged when a newly minted US Air Force arose as a separate service after the National Security Act, 26 July 1947. The Army-Air Force Implementation Agreements, 15 September 1947, began defining the separation of functions of the services that included assigning certain intelligence functions, strategic missile responsibility, air defense AAA, and research and development responsibility for guided missiles to the USAF. However, the Army retained control of the tactical missile systems—strategic systems moved to USAF responsibility.[20] Though these agreements defined many roles and functions, years of contention followed.

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[17] David Johnson, *V-1 & V-2: Hitler's Vengeance on London* (Manor NY: Stein and day Publishers, 1982), 66, 76, 87, 105, 157. Johnson's book covers several first-hand accounts as well as some statistics.

[18] USSBS, vol. 60, 23.

[19] Kipphut, 4. I agree with Kipphut's assessment of the USSBS, *V-Weapon (Crossbow) Campaign* (Washington, D.C. Military Analysis Division, 1945), 2-4. He also used the term "*qualified success*." Additionally, Michael J. Neufeld, *The Rocket and the Reich* (NY: The Free Press, 1995), discusses the impact of AO on the V-2 program. Neufeld does a fine job of detailing the dispersal required by air attacks and the conditions of the slave labor the Nazi state forced to build their V weapons. AO certainly affected V weapon production and employment.

[20] Richard I. Wolf, *The United States Air Force Basic Document on Roles and Missions* (Washington, D.C.: Office of Air Force history, 1987), 91. *Section IV* of the *Army-Air Force Implementation Agreements*, 15 September 1947, define which service

On 19 July 1948, the USAF gave the Army control over the research and development of guided missiles to fulfill Army roles and missions. However, all three services required guided missile programs. To reduce the overlap between the systems and the lack of "clear delineation" of the responsibility for current and future missile systems, Secretary of Defense Louis A. Johnson signed a Guided Missile Memorandum on 21 March 1950.[21] The result of this memorandum was to give the USAF exclusive control over strategic missiles, and responsibility for missiles which replaced fighter interceptors (in conjunction with the US Navy) and replaced ground support aircraft (in conjunction with the US Army). Additionally, the USAF and Navy shared air-to-air and air-to-ground missile responsibilities based on specifically named systems.[22] Moreover, the Vandenberg-Collins Agreement, 1 August 1950, provided roles and cooperative arrangements between the USAF and Army with respect to air defense organizations, placing Army staffs at each echelon of the AF command structure.[23]

Roles and missions debates continued. In 1952, several points were accepted between the Army and Air Force, including:

- Neither service would try to modify the other's roles and missions.
- The terms "tactical" and "strategic would not constitute a specific range.
- Surface-to-air weapons used as either extended or supporting artillery remained the Army's responsibility.

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gets what missiles. Additionally, AAA and training were discussed in this section. Wolf provides commentary, much of which is cited from Robert F. Futrell, *Ideas, Concepts and Doctrine: A History of Basic Thinking in the United States Air Force 1907-1964* (Maxwell AFB, Alabama: Air University Press, 1974). Additionally, Wolf provides the text of the original agreements and memorandums.

[21] Ibid., 207.

[22] Ibid., 207-220.

[23] Ibid., 219-220.

- The Air Force would not oppose Army development of missiles for low altitude surface-to-air interception.
- Missiles that would replace fighter interceptors were the responsibility of the USAF.
- "Battlefield isolation and interdiction of movement were Air Force functions."[24]

The controversy continued as both interceptor and long-range ballistic missile technology developed. Three separate missile development programs, one for each service, and numerous specialized ballistic and cruise missile weapons systems continued. The USAF guided missiles retained aircraft designations, and were treated as uninhabited aerial vehicles (UAVs). Moreover, the USAF created an Air Defense Command (ADC) to protect the continental US from Soviet bombers and established listening posts and collection networks in distant North America and along the coasts of the USA. The BOMARC, an early and significant USAF attempt at an unmanned aerial interceptor to supplement the manned interceptors for the ADC, was designated the XF-98.

BOMARC

The only surface-to-air missile developed by the USAF is the BOMARC, which grew out of a 1949 agreement with Boeing Aircraft to develop a pilotless interceptor that could destroy both bombers and cruise missiles.[25] The BOMARC was an unmanned interceptor—a cruise missile. Launched vertically, the BOMARC would climb to altitudes over 50,000 feet, then rotate to a horizontal, more conventional type attitude.

[24] Jacob Neufeld, *Ballistic Missiles in the United States Air Force 1945-1960* (Washington, D.C.: Office of Air Force History, 1990), 87-89.

Once within 10 miles or so of its target, the BOMARC's internal radar would guide the unmanned aircraft until intercept. In 1961, the Super BOMARC (BOMARC B) was tested against two US Navy Regulus II [26] missiles, intercepting the designated target at Mach 2, 100,000 feet altitude, and 375 miles downrange. At the height of the USAF BOMARC missile defense force, the USAF had 242 BOMARC B missiles in active duty. Deactivation began in 1964 and the last BOMARC was deactivated on 1 July 1972.[27]

Nike

With its genesis in WWII, the Army Nike was a surface-to-air ballistic missile. Nike became a project on 8 February 1945 after a contract was issued to a contractor to produce a study report on anti-aircraft guided missile problems.[28] In August 1945, the Army Air Forces (AAF) learned that Army Ordnance Department (ASF) planned to change the Nike into an interceptor missile by adding airfoils for maneuverability. This addition was a violation of the McNarney Directive, which stipulated that the AAF would develop missiles that relied on lift, or were launched from aircraft. Additionally, the Directive stipulated that the ASF would develop surface launched missiles that relied on momentum for flight. Doctrinal division with regards to missiles was indeed evident before the creation of a separate USAF. [29]

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[25] James Norris Gibson, *The History of the US Nuclear Arsenal* (Greenwich, CT: Brompton Books Corporation, 1989), 165-166.

[26] Ibid., 153-4. The Regulus II was the only supersonic surface-to-surface cruise missile developed by the US Navy.

[27] Ibid., 167.

[28] US Army Ordnance Missile Command, *Nike Ajax*, Historical Monograph, Redstone Arsenal, Alabama, 1 July 1962, 3.

[29] Neufeld, 18-21.

The US Army's Nike Hercules was a planned improvement to the Nike line that was planned before the Nike Ajax became operational. Achieving a production number of over 25,000 with 863 deployed by the US, the Nike Hercules was momentous effort designed to defend against an exaggerated Soviet nuclear bomber threat. Though the Congress wanted to decommission the Hercules in 1968, pressure from NATO allies forced the deployment until the SAM-D (now called the Patriot) was available for continued protection until 1984, when the last Nike Hercules was withdrawn from Europe.[30]

Though the Nike Hercules was designed for bomber defense, the Nike Zeus was designed to intercept hypersonic aircraft and ICBMs. Another Army project concurrent with Thor and Jupiter, among other systems development, the Nike Zeus was significant in that it was designed to intercept its targets in space. Before the Sputnik launch, all Army missiles were restricted to a 200-mile maximum range—after Sputnik, the 1956 range restriction was rescinded, opening a new venue for Army space operations. Though never deployed as an Anti-Ballistic Missile (ABM), Nike Zeus did become operational as an Army nuclear delivery device.[31]

Thor

Confusion between "tactical" and "strategic" systems continued with the Thor project. The Thor was originally known as a Tactical Ballistic Missile (TBM), then later redesignated as an Intermediate Range Ballistic Missile (IRBM), with a range of 1,000 to 2,000 miles. Though originally employed to replace the Matador tactical missile, the

[30] Gibson, 172-174.
[31] Ibid., 168-170.

USAF decided the Thor belonged in the strategic category. Additionally, the Thor was intended to counter a proposed Soviet fractioning orbital bombardment system, a space based weapon proposed in the late 1950s. In a parallel development track, the Thor continued as an Air Force program while a combined Army-Navy Ballistic Missiles Committee began development of the Jupiter IRBM. Intercontinental Ballistic Missiles (ICBM) and IRBM were assigned equal priority.[32]

A 10 November 1955 Air Force revised plan detailed the ICBM/IRBM administrative procedures. It also called for two IRBM programs of equal priority, an Office of the Secretary of Defense (OSD) Ballistic Missiles Committee (OSD-BMC) and an Air Force Ballistic Missiles Committee (AF-BMC). The Air Force continued to consider the question of missile priorities, development, and deployment.[33] Once Sputnik was launched on 4 October 1957, however, American ICBM programs and the Thor-Jupiter controversy accelerated. Because of the "dynamic nature" of the missile programs, Air Force leaders made provisions for frequent administrative and organizational changes.[34] Doctrinal and mission overlap and confusion continued as technology speeded systems development.

Sprint/Spartan

Because of shortcomings of the Nike Zeus in destroying ballistic missiles in the atmosphere, the Army began a study in 1959 for development of a high-speed, terminal phase interceptor. Concurrently, the improved Nike Zeus became the Spartan, the last US

[32] Neufeld, 143-149.

[33] Ibid., 271-313. The appendices included by Neufeld contain detailed memoranda concerning the early arguments over missile policy and administration.

[34] Ibid., 167-180.

nuclear tipped ABM. Together, these two weapons systems promised to provide overlapping nuclear ABM coverage.

In September 1967, Secretary of Defense McNamara announced that President Johnson decided to deploy the Sentinel ballistic missile defense system. In 1969, President Nixon renamed the Sentinel system to the Safeguard system, and realigned the focus of the ABMs to a mission of protecting US ICBM launch facilities.[35] Test missiles were flown from 1970 to 1973. However, with the signing of the SALT I treaty on 26 May 1972, US ABM systems development was severely restricted. With the acceptance of the 2 July 1974 ABM treaty, which restricted the US and Soviet Union each to two 100 missile ABM sites, further US ABM systems development slowed. On 1 October 1975, the only US ABM site, at Grand Forks, South Dakota, became operational with 70 Sprints and 30 Spartans.[36] In 1983, further development of the Sprint and Spartan weapons systems was supplanted by research into conventional ABMs and Thor was terminated.

SDI

Remembering a visit to Cheyenne Mountain as a presidential candidate, President Reagan announced a new missile defense policy in a speech on 23 March 1983. National Security Directive 85 became the formalized policy announcement which called for an extensive research and development program to provide a missile defense system to protect the United States from nuclear equipped ICBMs through space acquisition and intercept technology. Two studies were commissioned and completed that year: the

[35] BMDO, *Missile Defense Milestones*, available on line at http://www.acq.osd.mil/bmdo/bmdolink, 2 Dec. 1997.

Defensive Technologies Study (the Fletcher Report) and the Future Security Strategy Study (FSSS, the Hoffman Report).[37]

The FSSS reported that missile defenses could enhance deterrence and that an anti-tactical ballistic missile system could become the seed technology for a future national missile defense system (NMD). The Fletcher Report, not completed until early 1984, proposed different funding levels and plans for the President's directed research programs. The recommended plan became a guide for the Strategic Defense Initiative (SDI) and also recognized common links between terminal theater and ICBM systems (i.e., catcher's mitt systems).

On 6 January 1984, the Presidential National Security Decision Directive 119 formally established the Strategic Defense initiative to explore "the possibility of developing missile defenses as an alternative means of deterring nuclear war." [38] The Strategic Defense Initiative Defense Organization, SDIO, was created to administrate the SDI program. The missile defense resurrection sparked years of debate over the provisions and necessity of the ABM treaty, including friction within the US and between the US and the USSR. SDI continued as a non-nuclear based series of technology options to provide a ballistic missile defense system.

Judge Abraham Sofaer, the State Department Legal Advisor, presented his 1987 conclusion that the ABM treaty did not "preclude testing of space-based missile defense systems, including directed energy weapons."[39] Defensive satellites (DSATs), antisatellites (ASATs), and active terminal defense systems were seriously considered

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[36] Gibson, 170-172.
[37] BMDO, *Missile Defense Milestones*.
[38] Ibid.

and options were explored. These were not necessarily prohibited since the Outer Space Treaty nebulously precluded military bases and weapons testing on the moon or other undefined celestial bodies and nuclear or WMDs in space. The 1972 SALT I ABM Treaty (annex D) was focused on interference with "national technical verification," mainly reconnaissance and surveillance satellites.[40]

Theater missile defense systems were studied concurrently with national defense systems. The PAC-2 Patriot successfully destroyed another Patriot missile simulating an SS-23 ballistic missile in a November 1987 test while Brilliant Pebbles studies continued through the Reagan then Bush administrations. Also, ASATs launched by F-15 fighters at Edwards AFB were discussed in the media. When Iraq invaded Kuwait in August 1990, theater missile defense emerged as a predominant factor in the missile defense funding calculus. House Report 101-938, the FY 1991 Appropriation Conference Committee Report, called for a centrally managed TMD program to be established by the Secretary of Defense. Additionally, funding was to be provided through 1997 and multi-service requirements and participation was planned.[41]

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[39] Ibid.

[40] John M. Collins, *Military Space Forces: The Next 50 Years*, (New York: Pergamon-Brassey's International Defense Publishers, Inc., 1989) 46-47, 67. This book was a report commissioned by the US Congress, in 1987, to prepare "a frame of reference that could help Congress evaluate future, as well as present, military space policies, programs, and budgets." This was stated in the Congressional Introduction in Collins' book, xvii. Congressmen Skelton, Nelson, Spratt, Kasich, Volkmer, Blaz, and Senator Glenn signed the introduction and noted that congressional attention was required on the contained space and security issues.

[41] BMDO, *Missile Defense Milestones.*

The Gulf War

> The Scud, not the airplane, was Iraq's primary weapon during the air war. CENTCOM's air strikes hindered the Iraqi missile crews, but they never stopped them.[42]

Though Iraq employed theater ballistic missiles and chemical attacks during the Iran-Iraq war in the 1980s, few in the US public appreciated either the extent or implications of the WMD threat from third world countries. The very real possibility of US troops being attacked by ballistic missiles armed with biological or chemical agents appeared as a surprise—particularly when the Soviet Union was not associated with the attacks. However, US forces were not completely unprepared to deal with theater ballistic missiles. With a combination of defensive and offensive measures, a moderately effective TMD posture deployed during Operation Desert Shield. Before launch, fighter-bomber aircraft were capable of attacking fixed Scud sites with a high degree of reliability, and the US had the capacity to preemptively attack mobile Scud TELs (transporter erector launchers) with a somewhat lower degree of fidelity due to intelligence and C4I (command, control, communications, and intelligence) limitations. Scud sites and TELs were also subject to attack after their location was identified post-launch. Additionally, Patriot PAC-2 missiles, modified during the 1980s to provide greater anti-missile capabilities, provided a necessary back-up defense when Attack Operations failed to eliminate all threats preemptively. Without offensive air power and defensive anti-missile systems, the strong (but ambiguously stated) US WMD deterrence posture, and the outstanding conventional capabilities of the US and Coalition—WMD armed Scuds

[42] Michael R. Gordon and General Bernard E. Trainor, *The Generals' War* (Boston, MA: Little, Brown and Company, 1995), 228.

might have killed thousands. Therefore, the potential existed that a tactical weapon might have created horrific strategic effects.

Although Central Command (CENTCOM) planners retained plans to attack fixed Scud launchers in Iraq they did not plan on attacking mobile launchers since the Scuds were considered a "nuisance" weapon.[43] However, a different policy appears in interviews. For example, based on General Glosson's comments at a planning meeting in Saudi Arabia in mid-September 1990, he predicted F-15E tasking to attack mobile Scud sites:[44]

> …he (Gen. Glosson) made us realize what a problem we would have if Israel got involved because of the Scuds…He said, 'I know good and well we can use your airplanes better doing other things, but I can tell you right now, we're going to use a lot of your sorties chasing Scuds.'[45]

Although General Glosson anticipated a Scud Hunt for "political" reasons General Schwarzkopf reportedly, even after several Scuds were launched against Israel, regarded the Scuds "as having little military significance."[46] Cohen and Keaney note that the strategic air campaign changed on the second day of the war when "the first Scud missiles launched from western Iraq landed in Israel."[47] Moreover, the Scud threat,

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[43] Eliot A. Cohen and Thomas A. Keaney, *Gulf War Air Power Survey Summary Report* (Washington, D.C.: Dept. of the Air Force, 1993), 43.

[44] General Glosson was the leader of the Black Hole planning group in Riyadh. The F-15E aircrews he referred to had not trained for Scud Hunting missions, as it was a new concept and role.

[45] William L. Smallwood, *Strike Eagle* (Washington, D.C.: Brassey's Inc., 1994), 47. This portion of the decision making process regarding Attack Operations and the Scud Hunt was recounted by an F-15E Squadron Weapons Officer who attended several planning meetings with General Glosson. His comments revolved around a September 15, 1990 discussion with General Glosson.

[46] Gordon, 229.

[47] Cohen, 17.

WMDs, and the implication of Israel entering the war and thus dividing the coalition preoccupied Bush administration leaders:

> …the Pentagon knew it had a big problem on its hands. In the inner councils of the Bush administration, no problem worried officials more than what might happen if Israel entered the war.[48]

Though Iraqi fixed Scud sites were targeted on the first night, particularly in western Iraq, the pervasiveness of the mobile Scud threat became obvious the second night when Iraq fired Scuds at Israel. Considerable assets were diverted from strategic attack, interdiction, and other missions to suppress the mobile Scuds. The diversion of aircraft and bandwidth was greater than expected. Additionally, since the results of pre-emptive attacks against mobile launchers were not conclusive, pundits question the effectiveness of Attack Operations on mobile Scud TELs.

> The Scud hunt included continuous airborne surveillance of western and southern regions of Iraq, positioning strike aircraft within Scud launch areas for more immediate targeting, attacks on communications links thought to be transmitting Scud launch authorization, attacks on suspected sites, and strikes against Scud production and storage facilities. By war's end, nearly every type of strike and reconnaissance aircraft employed in the war participated in the attempt to bring this threat under control, but with scant evidence of success.[49]

Though the rate of Scud launches decreased with coordinated Attack Operations, faults were obvious in the joint concept of pre-emptive anti-missile operations. A critical problem was the lack of near real time intelligence and near perfect information.[50]

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[48] Gordon, 230.

[49] Eliot A. Cohen and Thomas A. Keaney, *Revolution in Warfare? Airpower in the Persian Gulf War* (Annapolis, Maryland: Naval Institute Press, 1995), 14-15.

[50] Maj. General Courder, personal interview with the author, 18 September 1997. General Courder's discussion of Dynamic Battle Control as required in the concept of operations for the attack of time critical targets is explored in more detail in chapters 3

Moreover, intelligence was a limiting factor in finding mobile Scuds and equipment. Coupled with those concerns were limitations on disseminating the information to special operations forces (SOF) or attack aircraft with appropriate sensors to find and destroy the mobile targets.

The *Gulf War Airpower Survey* noted the mixed effectiveness of Attack Operations. The authors observed that the Iraqi Scud campaign failed in its effort to split the Coalition. However, though the Scud weekly launch rate decreased by approximately fifty percent after the first week then remained low throughout the rest of the conflict, the Scud hunt was not deemed a success. This 100% success or failure mentality sets an interesting measure of accomplishment, and an unrealistic bar in war.

> So beyond the disruption induced by the level of effort put into the hunt for the launchers, Coalition air power does not appear to have been very effective against this militarily insignificant target category.[51]

On 25 February 1991, a conventionally armed Scud destroyed a US barracks in Saudi Arabia killing 28 Pennsylvania US Army reserve soldiers. Like the air and SOF campaign against the Scuds, this mishap and the occurrence of Scud parts raining down on Israel and Saudi Arabian cities was evidence that the catcher's mitt systems, particularly the Patriot, also had controversial results. Though the Patriots obviously contributed politically to maintaining the Coalition, as both a defensive military weapon and a bargaining chip to keep Israel pacified during attacks, their overall capability was disputed. The public debate over the operational effectiveness of Patriots and the nature of theater missiles, particularly their potential for creating both political and military

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and 4. "Near real time, near perfect picture," is a frequently cited desire for C4I and integration with a variety of airpower functions, including Attack Operations.

[51] Cohen, *GWAPS Summary Report*, 88-90.

results, encouraged both military and political investigations into improving TMD more rapidly.[52]

TMD and Anti-Missile Efforts through the 1990s

There was fairly rapid political movement to respond to Scud and other TBM threats in the US government after the demonstrative results in the Gulf War. March 1991 saw the establishment of a separate SDIO TMD department in response to H.R. 101-938 and the increased visibility of TMD requirements. On 5 December 1991, President George Bush signed H.R. 2100, the "National Defense Authorization Act for Fiscal Years 1992 and 1993," requiring the Department of Defense to "aggressively pursue the development of advanced theater missile defense systems, with the objective of down selecting and deploying such systems by the mid-1990s."[53]

Numerous flight and operational tests and exercises were accomplished in the areas of Attack Operations; battle management command, control, communications, computers, and intelligence (BMC4I)[54]; and a variety of catcher's mitt systems. In 1993, the SDIO was redesignated as the Ballistic Missile Defense Organization (BMDO). The

[52] Particularly when factoring-in WMD, the TBM debate showed that the political dimension of missile employment that was evident since WWII continued.

[53] BMDO, *Missile Defense Milestones.*

[54] BMC4I is frequently interchanged with the acronyms C4I, C3I and BM/C3I in a variety of missile defense publications and speeches. I use BMC4I to include all non-attack technologies and issues revolving around the collection and interface arena with respect to ballistic missile defense. General Ronald R. Fogleman used the term "BMC4I" in his presentation: "The Air Force Role in Theater Ballistic Missile Defense," remarks delivered to the American Defense Preparedness Association/National university Foundation Breakfast Seminar Series on Missile Defense, Counter Proliferation, and Arms Control, Washington, DC, 16 June 1995. The BMDO uses the term BM/C3I, dropping "computers," on their web site, available on line at http://www.acq.osd.mil/bmdo/bmdolink/html/tmdccc.html. Other briefings and

1993 Bottom-Up review provided $12 billion to Theater Missile Defense for the years FY95 to FY99.[55] This substantial commitment of funding demonstrated the intent to pursue serious TMD research and development efforts.

Another organization stood-up in January 1997 to contribute to US TMD capability was the Joint Theater Air Missile Defense Organization (JTAMDO). The objective of this office was to integrate the Defense Department's "requirements and activities for Theater Air and Missile Defense (TAMD)."[56] Further advancing the philosophy that the component commanders and military services should be involved in the development of joint mission capstone requirements, TMD architecture, and a joint capabilities roadmap, JTAMDO functions under the J-8 staff.[57] Essential verbiage in the JTAMDO charter includes the terms "systems interoperabilities" and "operational architectures." The coordination between the services' TMD programs and the production of a TAMD Master Plan was a step to further integrate systems beyond contentious roles and missions discussions and TMD philosophies of the services.

Test and exercise efforts within the USAF, not directly funded by the BMDO, continued to expand the USAF capability to contribute to TMD, particularly through BMC4I, airborne laser (ABL), and Attack Operations tests and exercises.[58] The USAF

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presentations use amalgams of these terms, but refer to them in a similar fashion. ACC has used the term C4ISR to denote adding surveillance and reconnaissance.

[55] BMDO, *Missile Defense Milestones.*

[56] News Release, *Joint Theater Air Missile Defense Organization*, (Reference Number: No. 021-97, Office of the Assistant Secretary of Defense, Public Affairs, 16 January 1997).

[57] J-8 is the Joint Staff's Director for Force Structure, Resources, and Assessment. JTAMDO is functionally located under this directorate.

[58] Some tests and exercises will be discussed the next chapter. Test results are classified at a variety of levels. Due to the desire to remain unclassified in this treatment,

chose to emphasize its Attack Operations and the ABL as the near-term and future mechanisms to kill enemy ballistic missiles. Having relegated the catcher's mitt systems to the other services, the USAF approach grew to promote the inherent flexibility of air and space power to destroy TELs and support equipment and personnel if presented with the proper intelligence in a timely manner. This effects based approach went beyond merely striking TELs. Including the C2 nodes and supplies broadened the contribution of USAF AO. The incorporation of both direct attacks and indirect attacks by the USAF (and air power in general) further advances US Anti-Missile strategies. Additionally, post-Gulf War analysis within the USAF led to concentrated efforts on data-link and increasing both the accuracy and speed by which information was transferred to aircrews. This preemptive and boost phase direction of USAF efforts dovetailed nicely with the BMDO emphasis on catcher's mitt systems, providing distinct and critical USAF contributions.

Background Conclusions

This chapter attempted to answer the question: What are the historical steps that have led toward the current US Joint TMD posture? A brief historical sketch was drawn of the development of key missile defense systems and philosophies. The historical steps that have led to this point of increased international and particularly US emphasis on TMD have their roots in the rockets and crude cruise missiles of WWII. However, doctrinal arguments and blurring of the roles and missions of the services have permitted both doctrinal debates and disagreement over the best manner to dissipate the TMD and WMD

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tests are not discussed in detail and the test that are mentioned are certainly not an inclusive list of USAF or joint programs.

threat. With regards to TBMs specifically, however, there is no debate on one conclusion: a multi-layered approach is required. BMC4I, Attack Operations, and the future ABL appear to currently constitute the strategic USAF contributions to TMD and Anti-Missile systems. More contentious are the issues of the allocation of funding priority, specific systems development programs, the balance of proactive Anti-missile Actions versus reactive TMD, and the role of the Joint Forces Air Component Commander (JFACC) in the air defense role.[59]

Currently, there are USAF and joint systems in the field that improve both BMC4I and Attack Operations, though another Scud hunt has not tested their effectiveness. The next chapter shall address key current and planned TMD systems. It shall begin with a review of the 1991 Joint Requirements Oversight Council (JROC) Theater Missile Defense Mission Need Statement. Particularly emphasized will be the USAF systems planned for present and near-term use. Doctrinal discussions will be mentioned for context—but the roles and missions debates will not be investigated in depth in this treatment.

[59] I did not solve the debate regarding whether offensive Attack Operations are merely another version of offensive counter air (OCA) missions for the USAF. However, propositions are presented in the last chapter of this treatment as suggestions to assist in resolving this debate. Also, debates over the effectiveness of preemptive operations continue, as a legacy of WWII and the Gulf War—as do debates over the Patriot's effectiveness in Desert Storm.

Chapter 3

TMD and Anti-Missile Options

War, like most things, is a science to be acquired and perfected by diligence, by perseverance, by time, and by practice.

Alexander Hamilton

The last chapter presented milestones that led to the current modern TBM threat and service philosophies to deal with that threat. A historical treatment leads to several questions that are addressed in this chapter. Since TMD is a process, not an event, this chapter presents a variety of solutions which, in the spirit of synergy and jointness, should be mixed together to increase their effectiveness. However, it is necessary to point out that the historical legacy of WWII Army Air Forces Attack Operations against V-1 and V-2 sites is now addressed in Joint Publication 3-01.5, *Doctrine of Joint Theater Missile Defense*, as AO. This publication considers inherently offensive AO as part of a joint concept of missile "defense."[60] Service philosophy, honed throughout the last five decades, affects TMD versus Anti-Missile Offensive Actions not only from a matter of perspective, but from the point of view of the true nature of "defense."

[60] Joint Pub 3-01.5, *Doctrine of Joint Theater Missile Defense,* 22 February 1996. This publication is not the basis for a doctrinal debate, but an example of that debate's compromise for a joint audience. More discussion of some of the many concepts in this publication is addressed throughout this chapter.

First, this chapter includes a discussion of the current and near-term TBM threat, answering the question: is there a current threat and what is it? This will establish the need for improved TMD. Second, the rationale for countering the TBM threat is discussed to establish the political and military reasoning process that will be used as a point of departure for further discussion. Next, current TMD options and concepts of operations follow, addressing the question: what is planned to positively affect the TBM situation? USAF systems and concepts will be covered in more detail, but doctrinal debates shall be avoided. Additional options, some advanced technological programs and others not found in the author's research are presented in the next chapter, as these core and other systems are evaluated.

The Threat

In *Strategic Exposure,* an Army sponsored RAND study, Lesser and Tellis propose that within ten years every southern European capital will be in the range of ballistic missiles based in North Africa or the Levant (including Syria, Iraq, and Iran).[61] They propose that Coalition building will become more complex as missiles proliferate in the Mediterranean and Levant.

> European allies, including states such as Portugal Spain, Italy, and Greece, which lack well-developed national means of deterring WMD attacks, might still offer access to bases and airspace, or contribute forces based on strong collective interest. But dialogue with the Unites States on these matters will be very different if Madrid, Nice, or Naples are clearly at risk.[62]

[61] Ian O. Lesser and Ashley J. Tellis, *Strategic Exposure: Proliferation Around the Mediterranean*, (Santa Monica: RAND (Prepared for the US Army), June 1996), x.

[62] Ibid., x, 27, and 32.

Lieutenant General Richard Bethurem, Allied Air Forces Southern Europe and 16th Air Force commander, agreed with *Strategic Exposure*. General Bethurem said that the threat in the NATO Mediterranean region has shifted dramatically from the north to the east and south, with the focus in Europe changing "from the Fulda Gap to the South."[63] However, not all ballistic missile threat countries are in or near the Mediterranean region. The BMDO cites that the following countries have or are in development or testing of ballistic missiles:

Table 1. Developing Countries and Ballistic Missiles

Afghanistan	Scud B	**North Korea**	Scud B, Scud C, No Dong, Taep'o Dong 1, Taep'o Dong 2
China	B-610, M-11, M-9, CSS2	**Pakistan**	Hatf 1, M-11, Hatf 2
Egypt	Scud B, Scud C, CSS-8, IRAN-170	**Saudi Arabia**	CSS-2
India	Prithvi, Agni	**South Korea**	NHK 1, NHK 2, Lance
Iran	Scud B, Scud C, Al Hussein, Al Abbas, Frog	**Syria**	SS-21, Scud B, Scud, C, Frog
Israel	Lance, Jericho 1, Jericho 2B	**Vietnam**	Scud B
Libya	SS-21, Scud B, Al Fatah	**Yemen**	SS-21, Scud B

***Source*:** BMDO: Ballistic Missiles and the World Security Environment Fact Sheet

The Rationale Behind Countering the Threat

Daily news and monthly publications are replete with references to theater ballistic missiles, weapons of mass destruction, and non-proliferation issues. Since the employment of TBMs and WMDs has been relatively rare, historically, why is the national and perhaps the international psyche so preoccupied with missiles and weapons with "little military significance?"[64] Positions taken by two powerful leaders during the Gulf War exemplify the military and political positions on TBMs—illustrating the

[63] Lt. Gen. Richard C. Bethurem, interview, 23 February 1998.

[64] Gordon, 229. Gordon and Trainer reported that General Schwarzkopf regarded Scuds as having little military significance.

common reprise, "where you stand depends upon where you sit." As General Schwarzkopf wrote:

> So in essence what they had was a weapon (Scud) that they (Iraq) could fly 300 miles and miss the target by a couple of miles with a warhead of only 160 pounds. Militarily, that was the equivalent of a single airplane flying over, haphazardly dropping one small bomb, and flying away—terrible for anyone it happened to land on, but in the grand scheme of warfare, a mosquito.[65]

This contrasted dramatically with Secretary Cheney's evaluation that reflected the strategic implications of the Clausewitzian refrain, "War is merely the continuation of policy by other means."[66] The political and strategic potential of TBMs armed with WMD again overrode the military appraisal. Cheney's comments, based on an obvious political-strategic point of view, as related by an aide:

> Goddamn it, I want some coverage out there. If I have to talk to Schwarzkopf, I'll do it...As long as I am secretary of defense, the Defense Department will do as I tell them. The number one priority is to keep Israel out of the war. [67]

Secretary of Defense Cohen's *Annual Report to the President and Congress*, 1998, states that: "the U.S. missile defense program places the highest priority on theater ballistic Missile Defense (TBMD) and Cruise Missile Defense (CMD) programs to meet today's threat."[68] The National Missile Defense program is relegated to second priority based on available technology, the level of threat, and spin-off technology from the

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[65] General H. Norman Schwarzkopf and Peter Petre, *It Doesn't Take a Hero* (New York: Bantam Books, 1992), 417.

[66] Carl Von Clausewitz, *On War*, trans. Michael Howard and Peter Paret (Princeton, New Jersey: Princeton University Press, 1989), 87. Often quoted, but rarely read, Clausewitz saw this political-military debate clearly nearly two hundred years ago. And as Clausewitz recommended, the Gulf War Scud hunt was an example of military resources diverted for political needs.

[67] Gordon, 334.

TBMD efforts.[69] In a similar vein, a majority report of the US Senate's Subcommittee on International Security, Proliferation, and Federal Services (part of the Committee on Governmental Affairs) confirmed the necessity for counter-proliferation efforts and recognized the extent for WMD and TBM proliferation as a significant and growing threat. Additionally, country by country, the Senate report discusses specific capabilities and threat possibilities and consideration. The Subcommittee states:

> The United States, like Gulliver, is a giant vulnerable to smaller nations. But unlike Gulliver, who was tied down while blissfully unaware of his surroundings, our government knows the new dangers presented by the world's rogue regimes. Now is the time to take decisive action to protect ourselves from the proliferation of weapons of mass destruction and their delivery systems."[70]

This concept of vulnerability dovetails with the national debate over casualties. Conventional wisdom stipulates that if casualties increase, the US public will require either a withdrawal of force or escalation for revenge. However, the evidence of history does not necessarily support these conclusions. Nevertheless, arguments against Attack

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[68] William S. Cohen, *Annual Report to the President and Congress* (Washington D.C.: GPO, 1998), 63.

[69] The GAO in their 1996 *Foreign Missile Threats: Analytic Soundness of Certain National intelligence Estimates* analysis of National Intelligence Estimates (GAO/NSIAD-96-225) produced by the National Intelligence Council argued that the NIE 95-19 was not specific and did not give enough quantifiable measures of the missile threat in various paragraphs. Particularly, the GAO believed that the NIE 95-19 understated the possibility of a missile threat to the contiguous 48 states and Canada (3). Additionally, the GAO found that some implicit assumptions were presented as statements that were not necessarily valid. These included statements about ships using cruise missiles against the continental US and the effects the Missile Technology Control Regime (MTCR) had on proliferation (7). These GAO arguments are further illuminated in *Foreign Missile Threats: Analytic Soundness of National intelligence Estimate 95-19 (GAO/T-NSIAD-97-53),* Testimony before the Select Committee on Intelligence, US Senate.

[70] Committee on Governmental Affairs, US Senate, *The Proliferation Primer*, January 1998, 1. Interestingly, this document was dedicated to the "28 American soldiers, victims of an Iraqi ballistic missile attack, Dhahran, Saudi Arabia, February 25, 1991."

Operations (or offensive operations over an enemy's territory) to destroy TBMs and associated equipment use casualties as a prohibitive element. Concurrently, some pundits rationalize that lower tier defensive systems, regardless of actual effectiveness, are preferable because they portend less loss of US life. This too is not necessarily accurate as destruction of WMD armed TBMs is best done as far from friendly troops or allies as possible. A recent study on casualty acceptance illustrates the deceptive nature of the casualty argument against offensive systems:

> The public's aversion to losses of U.S. life in recent U.S. military interventions thus has less to do with a recent decline in the public's willingness to accept casualties than the debatable (and debated) merits of the cases themselves. In fact, the public shows a highly differentiated view of recent U.S. military operations that argues against the simplistic view that the public is unwilling to accept casualties under any circumstances…[71]

This position of this Senate committee supports the position of the President regarding TMD. Unfortunately, the President does not mention the USAF TMD systems, relying instead on the catcher's mitt systems to illustrate the conventional perceptions of TMD. On 22 May 1996, President Clinton, during commencement ceremonies at the US Coast Guard Academy, remarked that:

> All of these things are focused on reducing the threat of weapons of mass destruction. But we also have to be prepared to defend ourselves in the extremely unlikely event that these preventive measures fail. That's why we're spending $3 billion a year on a strong, sensible, national missile defense program based on real threats and pragmatic responses. Our first priority is to defense against existing or near-term threats, like short- and medium-range missile attacks on our troops in the field or our allies. And

[71] Eric V. Larson, Casualties and Consensus: the Historical Role of Casualties in Domestic Support for U.S. Military Operations (Santa Monica: RAND, 1996), 50.

> we are, with upgraded Patriot missiles, the Navy Lower and Upper Tier and the Army THAAD.[72]

The development of counter-proliferation policy and awareness of the theater ballistic missile's potential for strategic effects from a militarily marginal weapons system has rapidly grown since the Gulf War. Though there are differences in policy over sanctions and economic incentives regarding WMD and missile proliferation, there is general agreement that some defense is required for US troops, allies, and eventually the US mainland itself. Therefore, TMD has grown from a cottage industry to a national priority. However, service priorities and philosophies affect the research and development plans. The next section in this chapter discusses, briefly, the requirements, basic doctrine arguments, then the different TMD systems according to service are discussed.

Requirements

The *Theater Missile Defense Mission Need Statement*, approved by the Joint Requirements Oversight Council (JROC) on 18 November 1991, calls for the requirement for a theater missile defense capability. This envisioned mission focused on the protection of US forces, US allies, other important countries and areas of vital interest from TM attacks. Furthermore, the objectives of TMD includes:

1) To prevent launch of TMs against US forces, US allies, and other important countries including areas of vital interest.

2) To protect US forces, US allies, other important countries, and areas of vital interest form TMs launched against them.

[72] President Clinton Coast Guard Commencement, 22 May 1996, on line, Internet, 12 January 1998, http://www.acq.osd.mil/bmdo/bmdolink/html/clintoncg.html.

3) To reduce the probability of and to minimize the effects of damage caused by TM attack.

4) To detect and target TM platforms, to detect, warn and report of TM launch, and to coordinate a multifaceted response to a TM attack and to integrate it with other combat operations.[73]

The Co-Chairs of the JROC amplified the mission statement in a memorandum they authored concerning the need to pursue TMD. Their statement also shows the progression in the importance of TMD after the Gulf War, including the political and military overlap of the strategic consequences of TMs, particularly with WMD.

> The term theater missile belies its import. They are not just another combined arms battlefield weapon. The motives of potential adversaries to possess these weapons are decidedly strategic. They offer a relatively low cost way to threaten population centers and critical military targets like ports and other points of entry in order to coerce neighbors, breakup coalitions and deter US military involvement in their region. They can raise the stakes even higher when they carry chemical, biological or nuclear payloads. The gravity of this threat requires continued special attention be given to efforts to counter it.[74]

The JROC Mission Needs Statement (MNS) for TMD also made the observation that the TM threat could not yet be countered by any single system—a mix of capabilities was required. "TMD will require a balance of integrated Attack Operations, comprehensive active defense against missiles in flight, extensive passive measures, and a robust C3I and surveillance capability responsive to unique TM characteristics."[75] This helped institutionalize the requirement for a variety of approaches, but with the freedom and

[73] JROC, *Theater Missile Defense Mission Need Statement*, (JROCM-064-91), approved on 18 November 1991.

[74] David E. Jeremiah (Vice Chairman Joint Chiefs of Staff, Chairman JROC) and Theodore Gold (JROC Co-Chairmen), Memorandum for Chairman, Defense Science and Chairman, Defense Policy Boards, not dated.

necessity to integrate completely different systems and philosophies, doctrinal friction resulted.

Doctrine

Joint Pub 3-01.5, *Doctrine for Joint Theater Missile Defense,* is a good attempt at consolidating multi-service TMD philosophies. The JP 3-01.5 defines four operational elements of TMD: Passive Defense; Active Defense; Attack Operations; and Command, Control, Communications, Computers, and Intelligence (C4I). Passive Defense concerns efforts to reduce vulnerability and minimize effects of TM attacks. Active Defense includes operations that destroy TM "airborne launch platforms" or missiles in flight. Attack Operations include operations to "destroy, disrupt, or neutralize TM launch platforms and their supporting structures and systems." C4I coordinates and integrates. However, "**All TMD systems must integrate with the existing command and control (C2) architecture**."[76] Please see Figure 1 for the joint TMD pillars. It is important to note that the USAF dominates in the Attack Operations and BMC4I pillars. Once the Airborne Laser is operational, the USAF will become more involved in the "shooting" segment of Active Defense.

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[75] JROC, *Theater Missile Defense Mission Need Statement,* 5. Potential material alternatives and key boundary conditions were discussed further in the MNS if information on the initial TMD proposals in that document is desired.

[76] Joint Pub 3-01.5, *Doctrine for Joint Theater Missile Defense*, 22 February 1996, viii. Boldface is in the original document. Frequently, these elements are referred to as "pillars."

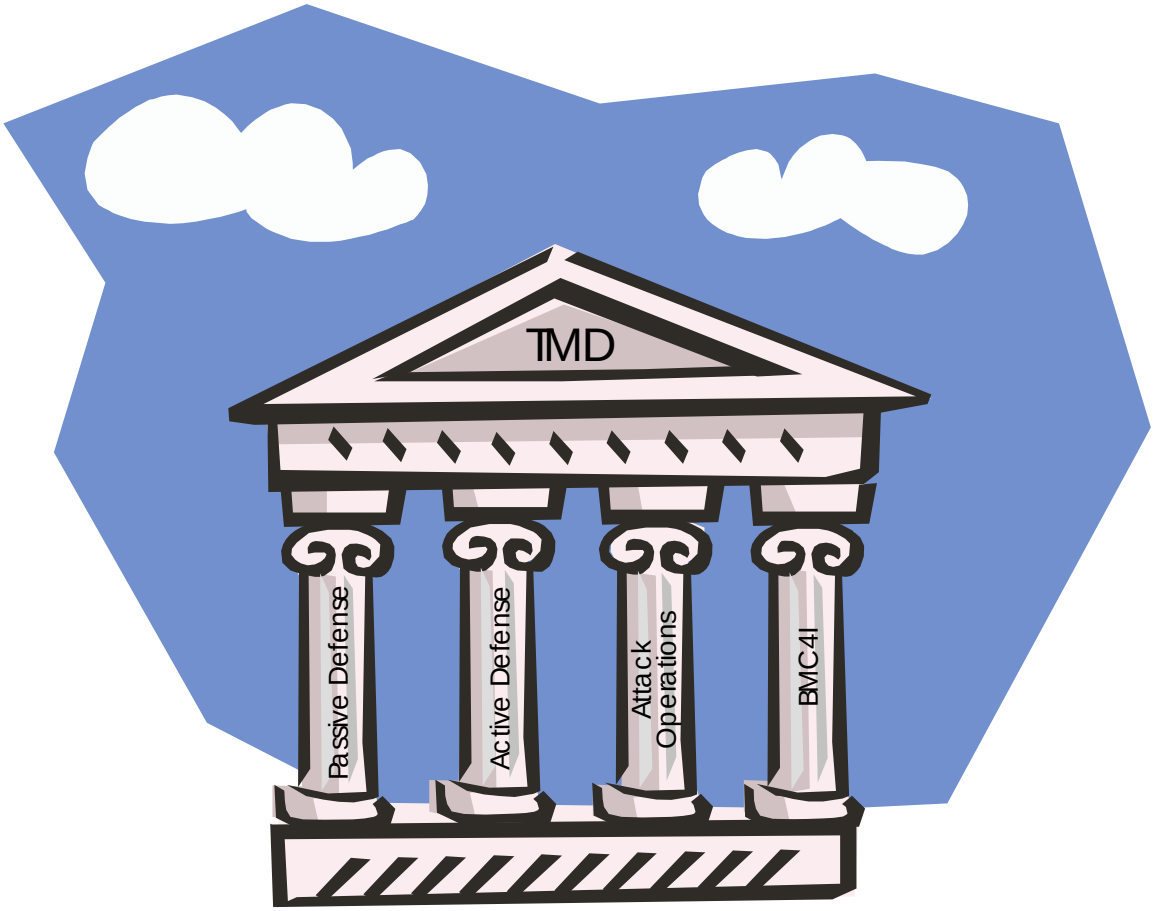

Figure 1. [77]The Current Joint TMD Concept

The historical differences between the services create inherent conflicts. The general disagreement regards the USAF historical concept that air power is best employed offensively, but TMD is discussed with ground-forces frames-of-reference where defense is absorbing punishment in an attempt to regain the initiative and go offensive. As the

[77] Please note Figure 1 represents a visual of the JP 3-01.5 concept. Later, Figure 2 illustrates a more appropriate relationship of the last three pillars with regards to borders, time, space. Particularly, BMC4I appears to this author to be more overarching of a capability than the pillar allocated to it in the current JP 3-01.5 concept relates. The synergies are not readily apparent in this popular pillar construct.

Army's previous FM 100-5, *Operations*, states, "Defensive operations control the enemy's attack while preserving the defending force."[78]

A conventional delineator between defensive and offensive actions in the USAF, as stated in AFDD-1, is the enemy border. Offensive Counterair (OCA) is defined as the freedom *from* attack and the freedom *to* attack. This is based on the USAF proposition that "air and space forces are inherently offensive and yield the best effect when so employed."[79] However, since the Joint Pub takes precedence, application of AFDD-1 to the Joint concept of AO requires reconsideration. Additionally, the ABL destroying ascending enemy missiles might be considered Defensive Counterair (DCA), using AFDD-1's definition of protecting friendly forces, material, and infrastructure unlike the use of SOF teams or fighter-bombers to preemptively destroy BM launchers (OCA) or missile supply depots (AI or SA).[80] Another interpretation, elegant in its simplicity, was made on stage at the November 1997 *Air and Space Conference*: OCA is parts falling on the enemy's side of the border while DCA is parts falling on our side.[81]

Air Combat Command (ACC) produced a combat air forces (CAF) paper, C*oncept of Operation* (CONOPS) *for Command and Control against Time Critical Targets* (TCTs). The coordinated position states that "The Air Force core objective for this concept is to attack and destroy Theater Missiles (TMs) and other TCTs as far into the enemy's

[78] FM 100-5, Operations, June 1993, 6-19 to 6-22. Quote from 6-22.
[79] AFDD-1, 46.
[80] Ibid., 47.
[81] *Air and Space Conference* at Maxwell AFB, Alabama, 19 November 1997. Furthermore, whether from space, the ABL, or fighters, the goal was to protect ourselves from enemy airpower. That included missiles.

territory as possible, when they are least threatening to friendly forces."[82] The Theater Air Control System (TACS) is the Joint Air Component Commander's (JFACC) C2 network to engage all TCTs except in close air support operations (CAS). Though produced before the current AFDD-1, this document illustrates the USAF attempt to operate within the structure of the JP 3-01.5. ACC defines AO as comprised of OCA, Air Interdiction (AI), and Strategic Attack (SA). Moreover, they state that "Attack Operations *prevent* TM attacks."[83] Furthermore, DCA is the USAF version of Active Defense that *limits damage* from TM attacks and Passive Defense incorporates early warning, NBC protection, concealment, and hardening.

Obviously, there is doctrinal friction. Some of the more salient points of contention include: the role of the JFACC controlling all air defenses in theater, the line between Attack Operations and interdiction or strategic attack (especially when WMD is considered), allocation of space assets or other C2 assets to BMC4I functions, and the proportionality of funding offensive versus catcher's mitt systems. However, though some measures should be resolved, the inherent friction with and between services and agencies is healthy to keep doctrine from becoming stagnant and therefore dogma. The next section addresses the core systems of the BMDO, the services, and some additional TMD concepts beyond the systems themselves.

[82] Major General John W. Hawley, HQ ACC/DR, ACC/CC, Combat Air Forces Concept of Operation for Command and Control against Time Critical Targets, 8 July 1997, 6.

[83] ACC, *CAF CONOPS for TCT*, 7. Italics included in the CONOPS.

Options for TMD

The BMDO has several programs that it considers as "core programs." These include the PATRIOT Advanced Capability-3 (PAC-3), Navy Area TBMD, Theater High Altitude Area Defense (THAAD), and Navy Theater Wide (NTW) systems.[84] Additionally, the improved Homing-All-the-Way-Killer (HAWK) missile system, ABL, AO, BMC4I, ARROW, Medium Extended Air Defense System (MEADS), and other systems make up ancillary programs, complementary, or competing systems. Various CONOPS are recommended for the systems, their integration, and C2. This section shall review the core systems briefly, discussing those and some other systems for familiarity with the FoS architecture options. Additionally, a few unique concepts for systems or systems integration is presented. Since a multi-layered approach is prudent, there is no intent to disparage systems, just present facts in this section. This section sets the stage for comparing the systems and added operational possibilities in Chapter 4. Please see Figure 2 for a graphic depiction of the systems discussed in this section, their anticipated phase of use, and the USAF paradigm of operations compared to Joint terminology.

[84] BMDO Fact Sheet 97-05, Ballistic Missile Defense—The Core Programs, September 1997.

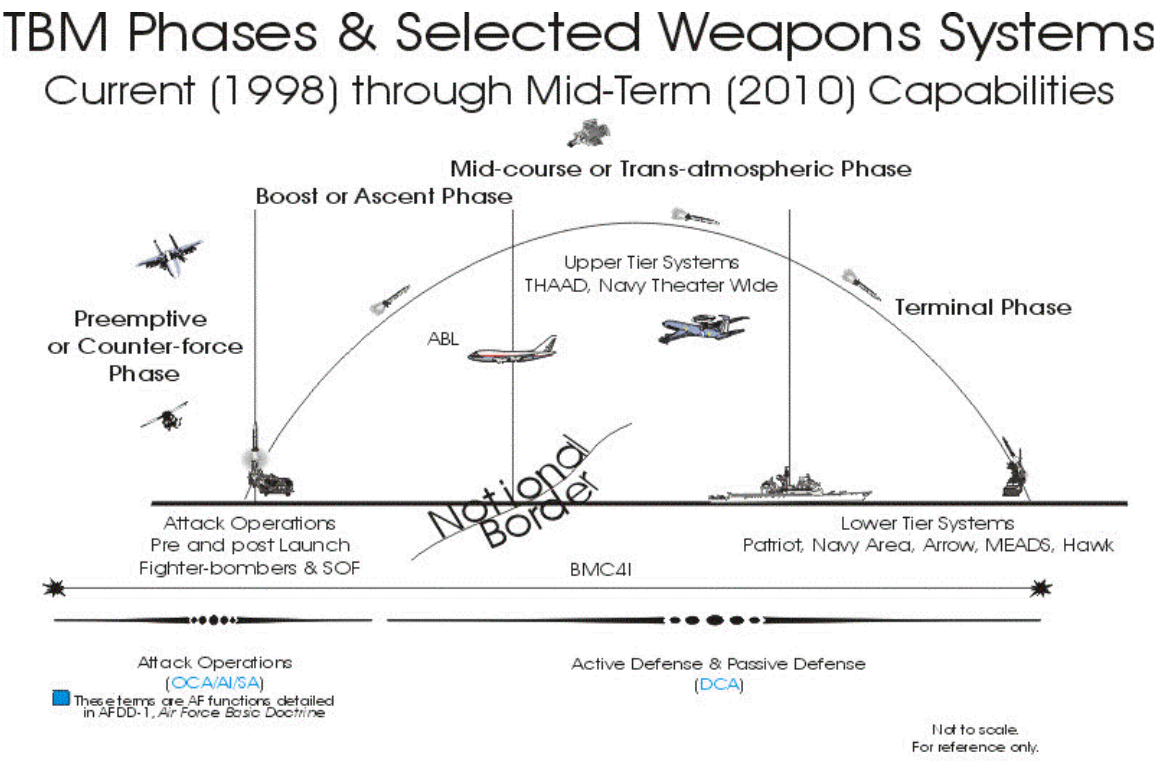

Figure 2. TBM Phases and Selected Weapons Systems information compiled from multiple sources.

Lower Tier: Terminal Phase Systems

Patriot

The PATRIOT Advanced Capability (PAC-3) is the upgraded follow-on to the Gulf War weapon that appeared so successful during the conflict. According to Secretary Cohen, the PAC-3 "provides air defense of ground combat forces and high value assets against high performance air-breathing and theater ballistic missiles."[85] A core BMDO system, PAC-3 is a point defense weapon that has some ability to defend against cruise missiles, aircraft, and TBMs—in their terminal phase. PAC-3s can be airlifted. Though air mobile, it is a relatively stationary system.

According to the BMDO, the PAC-3 is the most mature of all the TAMD systems. This system's third and final "configuration" is undergoing testing and it is currently in the Engineering and Manufacturing Development (EMD) acquisition phase. The First Unit Equipped (FUE) date is late in FY 1999.[86] One essential feature of the PAC-3 is that it is a "hit-to-kill" system, which detractors frequently describe as hitting a bullet with a bullet. However, the BMDO emphasized the capability to counter WMD through "hit-to-kill," systems.[87]

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[85] Cohen, *Annual Report*, 64.

[86] Lieutenant General Lester L. Lyles, Director, BMDO, Congressional Testimony before the Subcommittee on Strategic Forces Committee on Armed Services, US Senate, 24 March 1998. Patriot configuration two is currently fielded.

[87] Lieutenant General Lester L. Lyles, Director, BMDO, "Opening Remarks," Congressional Testimony before the Subcommittee on Strategic Forces Committee on Armed Services, US Senate, 24 March 1998. This is a related but separate briefing from the actual testimony given before the Senate committee.

Navy Area

The Navy Area system is a terminal defense missile launched from AEGIS cruisers (Ticonderoga class) and Destroyers (Arleigh Burke class).[88] The goal of the Navy Area program is to provide "US forces, allied forces, and areas of vital national interest with an active defense against theater missiles."[89] This system was not approved for entry into EMD until February 1997. The Navy Area MD program builds on the current AEGIS/STANDARD Missile air defense system, including radar and missile upgrades. The Navy emphasizes that sea-borne TMD provides reduced costs by building upon current platforms and will reduce demands on airlift and sealift.[90] Its testing schedule includes flights planned in FY 1999 with sea tests in FY 2000. A core BMDO weapons system, FUE in FY 2002 is expected for the Navy Area system.[91]

MEADS

The Medium Extended Air Defense System (MEADS) is a more mobile lower-tier program that the US is cooperatively pursuing with Germany and Italy.[92] The BMDO states that MEADS will play a key role in reducing the risks of Army and Marine Corps operations as it is the only TMD system that "can provide maneuver forces with 360 degree defense protection against short-range tactical ballistic missiles, cruise missiles and unmanned aerial vehicles."[93] The BMDO concept is that MEADS will bridge the gap

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[88] BMDO Fact Sheet 97-05, September 1997.

[89] Cohen, *Annual Report*, 64.

[90] BMDO Fact Sheet 97-18, Navy Area Ballistic Missile Defense Program, July 1997.

[91] Lyles, Congressional Testimony, 24 March 1998.

[92] Cohen, *Annual Report*, 64.

[93] BMDO Web, Theater Missile Defense Program Medium Extended Air Defense System (MEADS), available on line at http://www.acq.osd.mil/bmdo/bmdolink/html/meads.html, 12 January 1998.

between hand-held, man portable systems like the Stinger and higher level systems like the PAC-3—an intended replacement to the HAWK. Low rate production is tentatively planned for 2003 with fielding in 2005.[94] The Government Accounting Office (GAO) reports that the total cost of the Navy Area program is projected to be $8.98 billion. Furthermore, the GAO recommended slipping the production of the Block IVA interceptor missile until the conclusion of independent testing:

> Given that each block IVA missile is expected to cost an average of about $2 million, it could easily cost more to fix already produced missiles if problems are revealed during subsequent testing, than it could cost to restart production. We believe it may be more cost-effective to incur some restart costs, rather than enter production without adequate testing.[95]

HAWK

The HAWK is a low-to-medium altitude air defense system that has been in service approximately forty years to date. Currently, fifteen countries maintain the HAWK. The HAWK is the only ballistic missile defense system for the US Marines and it is relied upon to protect Marine expeditionary forces. Upgrades to the HAWK have improved its ability to intercept theater ballistic missiles. These upgrades include modifying the air

[94] BMDO Fact Sheet 97-13, *Medium Extended Air Defense System*, July 1997. The dates are planned with a 60-25-15 cost ration for the US, Germany, and Italy, respectively. France was in the initial plan, but they dropped out in the mid-1990s. Funding is committed only through the PD-V phase, so this program's success is certainly not assured.

[95] GAO, Report to the Secretary of Defense, *Ballistic Missile Defense—Improvements Needed in Navy Area Acquisition Planning*, (GAO/NSIAD-98-34), November 1997, 11. The DOD disagreed with the GAO recommendation. This report contains the DOD response to the GAO.

surveillance radar system to ease missile detection, data links, and the missile itself. By the end of FY 1997, the Marines possessed 1000 improved HAWKS.[96]

ARROW

The ARROW is a joint US-Israeli missile defense system program. The ARROW will be interoperable with US theater missile defense systems and will be capable "to assist in the protection of forward deployed US and Coalition forces."[97] The engagement footprint of the ARROW falls between the PAC-3 and the THAAD, making ARROW more of a mid-tier program. The ARROW Deployability Program (ADP), an integration program conducted in cooperation with the US, will continue through 2001. The DoD hopes that ARROW flight test data will also provide technological spin-offs and be used as a "risk-reduction measure" in US TMD development.[98]

Upper Tier: Midcourse or Trans-atmospheric Phase Systems

THAAD

The Theater High Altitude Area Defense (THAAD) system is a core upper-tier program. THAAD will protect "broad areas, dispersed assets, and population centers."[99] As a ground based high altitude weapons system, THAAD will use exo-atmospheric and endo-atmospheric intercepts with a hit-to-kill termination of the engagement. The BMDO expects that the US Army will field THAAD in 2006.[100] Additionally, by hitting TBMs at longer range, upper tier systems "will give us more time for multiple shot

[96] BMDO Fact Sheet 97-11, *The HAWK System*, July 1997.
[97] Cohen, *Annual Report*, 65.
[98] BMDO Fact Sheet 97-08, *ARROW Deployability Program*, July 1997.
[99] Cohen, *Annual Report*, 64.
[100] BMDO Fact Sheet 97-05, September 1997.

opportunities."[101] The GAO recommended that the BMDO delay initial production of the THAAD until after certification based on independent testing in an operational environment "that the system can meet its key performance requirements."[102] The DoD did not concur. Additionally, the GAO recommended that the Secretary of Defense submit an estimate of the funding that would be required to implement "a treaty compliant, longer-range missile target program consistent with the revised THAAD test schedule." The DoD partially concurred on this recommendation and noted that the BMDO is reviewing fund shortfalls.[103]

Navy Theater Wide

The Navy Theater Wide (NTW) is an upper-tier system for the AEGIS cruiser that builds upon the Navy Area system. By being placed on a ship, the NTW has the potential of mobility for a wider area defense. Beginning in 2000, the Navy will begin guided tests of the SM-3 intercepting test vehicles. Moreover, the BMDO points out that the NTW has capabilities in other phases of flight of an incoming missile, unlike the THAAD. The NTW is designed to provide an intercept capability against medium and long-range TBMs. When the ship is moved near the enemy TBM launch site, the NTW could intercept the TBM in the ascent phase. Depending upon AEGIS positioning, the NTW might intercept a TBM along its trajectory, mid-course. When the cruiser is positioned

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[101] BMDO Web, *Theater Missile Defense Program Theater High Altitude Area Defense*, available on line at http://www.acq.osd.mil/bmdo/bmdolink/html/thaad.html, 12 January 1998. The question of why we do not expend more BMDO or JTAMDO efforts in the area of preemptive Attack Operations, which provides the most range, time, and WMD defense, is discussed in the next chapter.

[102] GAO, Report to the Secretary of Defense, *Ballistic Missile Defense—Improvements Needed in THAAD Acquisition Planning*, (GAO/NSIAD-97-188), September 1997, 7. The DOD disagreed with the GAO recommendation. This report contains the DOD response to the GAO.

nearer to the defended area, it would provide decent phase (including terminal) intercepts.[104] Fielding of this system is expected in 2006.[105]

Boost or Ascent Phase Systems

Airborne Laser

The primary boost-phase program is the Air Force managed and funded Airborne Laser (ABL) program. The ABL program is scheduled to provide an airborne demonstration in 2002. The DoD feels that the ABL will help deter TBM use and provide an additional TMD layer of protection because missiles struck in the ascent phase would fall back down on enemy territory.[106] Additionally, when future TBMs have the ability to fractionate before apogee, terminal systems could be overwhelmed.[107] Boost phase (or earlier) destruction would help to avert this condition. By using an on-board, passive, 360-degree infrared sensor, the ABL will be capable of autonomous detection, acquisition and tracking as well as external cueing.[108] The ABL's extremely rapid

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[103] GAO, *THAAD*, 13-14. This was derived of the DOD response.

[104] BMDO Fact Sheet 97-19, *Navy Theater Wide Ballistic Missile Defense Program*, October 1997. The SM-3 is the Standard Missile 3. The Navy Area program also builds on the Standard Missile system.

[105] General Richard Davis, Deputy Director, BMDO, Special DoD News Media Briefing, 10 March 1998, transcript available on line at http://www.acq.osd.mil/bmdo/bmdolink/html/dav10mar.html, 24 March 1994. In the briefing, the General was asked a question concerning the NTW about early fielding if more money was given to the system. The General responded that 2006 was the anticipated time period.

[106] Cohen, *Annual Report*, 64.

[107] To fractionate is essentially to divide or split into multiple pieces creating a targeting problem for defensive catcher's mitt systems similar to that posed by a salvo launch.

[108] Fogleman, "The Air Force Role in Theater Ballistic Missile Defense."

deployment capability is a selling feature, as is its early detection and destruction capability.

The ABL program will integrate a "multi-megawatt Chemical Oxygen Iodine Laser into a Boeing-747 aircraft to kill boosting TBMs at ranges in excess of several hundred kilometers."[109] An anticipated concept of operations involves seven planned ABL aircraft, 747-400s. During a conflict, five aircraft will support two combat air patrol (CAP) orbits in a theater. Two aircraft will be on station at the CAP, two will be en-route, and one will be on ground alert. The other two aircraft will be available for CONUS training or other uses. Normal station time will be 12 hours, with a 22-hour maximum. Airborne refueling will allow for 24-hour operations.[110]

The ABL Program Plan called for development, testing, and production between 1993 and 2008. A lethal intercept demonstration is planned in 2002, three aircraft will be ready in 2006, and the full planned capability of seven aircraft available in 2008.[111] The GAO made two recommendations to the Secretary of Defense: establish a correlation between optical and non-optical turbulence data and validate the appropriateness of the design based of turbulence.[112] The DoD concurred with the GAO recommendations, but the USAF disagreed that many of the faults found in the GAO report, stating that many "mis-statements and inferences contained in the GAO report appear to parallel themes

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[109] *1997 United States Air Force Issues Book*, Airborne Laser, available on line at http://www.af.mil/lib/afissues/1997/app_b_14.html.

[110] *1997 United States Air Force Issues Book*, Airborne Laser, available on line at http://www.af.mil/lib/afissues/1997/appb7.html.

[111] ABLPROG 97BRIEF – 997OIPT.PPT/SLD 9, 24 September 1997. This slide was provided by XORFS at the Pentagon, 6 February 1998.

[112] GAO, Report to the Secretary of Defense, *Theater Missile Defense—Significant Technical Challenges face the Airborne Laser Program*, (GAO/NSIAD-98-37), October 1997, 13. The DOD concurred with the GAO recommendations.

voiced early in the ABL program and resolved as part of the existing…process."[113] In effect, the USAF understands the GAO concerns and is already in the process of resolving or has resolved turbulence, air mass, and other contentious issues.

Preemptive or Counter-force Phase

Attack Operations

General Fogleman succinctly defined the USAF concept of Attack Operations (AO):

> First, the Air Force is aggressively working to improve its ability to mount Attack Operations against mobile theater ballistic missiles (TBMs). These operations are part of the overall theater air battle which is orchestrated by the joint force air component commander, or JFACC. The goal will be to destroy enemy TBMs and the infrastructure that supports them—day or night, in good weather or bad.[114]

The TMD AO objective is "to prevent launch of TMs against US forces, US allies, and other important countries, including areas of vital interest."[115] To accomplish this objective, AO can be divided into six key functional areas: ISR Systems, BMC4I Systems, Strike Systems, Strike Weapons, TMD-AO Targets, and Mission Assessment. By focusing on the ISR, BMC4I, Strike Systems and Weapons, organizations are currently creating and applying doctrine, strategy, CONOPS, tactics, techniques,

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[113] Air Staff Summary Sheet signed letter attachment, Arthur L. Noney, Assistant Secretary of the Air Force, AF Response to Final GAO Report on Airborne Laser, 4 December 1997.

[114] Fogleman, "The Air Force Role in Theater Ballistic Missile Defense," remarks on 16 June 1995.

[115] XORFS, "USAF Roadmap for Theater Missile Defense Attack Operations," Archived Briefing at XORFS, presented 27 July 1997 (unclassified extract dated 5 February 1998 used as reference). The TMD Roadmap taskforce was led by LTC Mo Rolfs at AF/XORFS. They incorporated a strategy to task analysis of AO and AF TMD. For further information, please consult the Counterair (Theater Missile Defense) Mission Area Plan, FY 1996, 15 Nov 1995. This roadmap provides insight into the linkages between AO and C4I as well as some details on specific systems.

procedures, testing, training, and exercises to advance AO conceptually and materially. To serve as an AO focal point for all services and create a joint investment plan, the Joint Attack Operations Working Group (JAOWG) was created.

The JAOWG breaks AO into several prioritized activities to assist in conceptualization and investment strategies: Intelligence Preparation of the Battlespace (IPB), Classify/Identify, Data Management, Task and Direct, and Make Commit Decision. Additionally, they are aware of integration and management concerns as well as countermeasures, such as foliage penetration and penetrating weapons. Due to the time criticality of finding and destroying TBMs and associated equipment across a theater of operations, close and synergistic ties necessarily exist between AO and BMC4I.[116]

In the near-term, by 2005, the AO gameplan is to be able to find—fix—track—target—engage TBMs and associated equipment. This includes attacking "strategic targets" like factories. Additionally, interdiction targets, such as TBM and WMD storage sites, fixed and mobile C2 nodes, and supply-lines, would be subject to attack. Finally, AO target sets would include pre- and post-launch TBM sites. Data-link and off-platform sensors would assist in completing these missions under the rubric of AO.[117] Inherent in a USAF AO Anti-Missile concept is effects-based targeting. This includes the associated missions of AI, for supply-lines and storage areas, and SA for the factories and C2 nodes,

[116] JAOWG, "Integrated Investment Strategy," Draft Briefing, 5 February 1998. This conceptual breakdown helps to understand the level of integration necessary to conduct AO on a planned basis. Budgeting information is contained in detail in this briefing.

[117] Major Brad Butz, AF XORFX and SAF AQPT, "USAF Attack Operations," briefing for Lt. Gen. Lyles, 9 February 1998. During the research of this thesis, Maj. Butz was the AF XO representative to the JAOWG and intimately involved with producing USAF TMD program analysis and management.

for example. These peripheral attacks alone will not eliminate the missile threat, but they reduce the TBM/WMD threat and may contribute to further other JFACC's objectives.[118]

SOF can also contribute to AO missions, but it is not discussed in detail in these forums. SOF relies on its insertion capability, but also requires BMC4I elements to find—fix—track TBMs. With miniaturization and advances in bandwidth and communications technology, SOF AO activities will be enhanced through C4I efforts. Faster or stealthier insertion methods would also assist in TMD efforts, but are not necessarily TMD driven functions.

The USAF mid-term projection, for the 2010 timeframe, incorporates the near-term strategies plus it adds improvements to information transfer and acquisition, better precision weapons on more stealthy platforms, and more advanced C4I systems. The incorporation of stealthy assets is important because air and space superiority is required to conduct Attack Operations. In a non-permissive environment, or with limited suppression of enemy defenses (SEAD) capabilities, stealth will allow unhampered AO to counter TBMs.

A 1994 RAND white paper discussed some USAF concepts for AO. The authors divided the ground, pre-launch phase into two sub-phases: uncommitted and committed. Uncommitted refers to TBM operations before the missile system's final exposure before

[118] LTC Chris W. Bowman, personal interview with the author, 2 April 1998. LTC Bowman, an experienced Pentagon AF/XOOC, Checkmate team leader, reinforced this author's supposition that attacking C2, maintenance facilities, storage, and production facilities for TBMs and associated equipment is AO. These attacks are also covered in the AFDD-1 under different rubrics, causing possible doctrinal ambiguities when compared to the concepts in JP 3-01.5.

launch while committed starts with the final exposure and ends with the launch.[119] Additionally, with regards to AO, this study reports that post-launch is the easiest defense phase (i.e., striking a TEL after it has launched, making it inoperable for future launches). Post launch AO should not have its importance diminished—rules of engagement may preclude preemptive operations, but striking a TEL or fixed site after launch will ensure future launches from that facility are prevented. It is important to note, however, that sensor and C4I programs are critical to the success of AO, as well as the other later phase anti-TBM concepts.

BMC4I

Besides the ABL and AO, the third area the USAF emphasizes in its TMD efforts is BMC4I. This area is woven into all joint TMD programs; effective BMC4I is a necessary precondition for effective TMD. Additionally, ballistic missile defense sensors, C4I, and Cooperative Engagement Capability overlap into Cruise Missile Defense (CMD).[120] The BMDO defines its role in relating the primarily USAF BMC4I efforts into their joint missions by including "early warning and dissemination, ensuring communications interoperability, and upgrading command and control centers."[121] Their goal is to integrate the various systems and equipment, including sensors, interceptors, and tactical control centers into a joint theater-wide TMD architecture.[122]

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[119] David Vaughan, Jeff Isaacson, Joel Kvitky, and Richard Mesic, Evaluation of Operational Concepts for Countering theater ballistic Missiles, White Paper (Santa Monica: RAND, 1994), 1.

[120] Cohen, *Annual Report*, 64-5.

[121] BMDO Web, *Joint Theater Missile Defense Programs—BM/C3I*, available on line at http://www.acq.osd.mil/bmdo/bmdolink/html/tmdccc.html, 12 January 1998.

[122] Ibid.

Some BMC4I systems include uninhabited aerial vehicles (UAVs), RF-16, U-2, Joint Stars, Rivet Joint, Compass Call, Cobra Ball, and a variety of other space, airborne and ground assets. Attack and Launch Early reporting to Theater (ALERT) provides rapid missile launch warning from sensors and improved cueing for theater defenses. Currently operated by the 11th Space Warning Squadron, ALERT relies on infrared data from the Defense Support Program (DSP) satellites, as well as other assets, to identify missile launches.[123] Communications occurs through data links, most notably Link 16 and the Joint Tactical Information Distribution System (JTIDS) provides connectivity between shooters and C2 entities.[124]

The Theater Air Control System (TACS) provides rapid C2 for TMD and other TCTs. Dynamic Battle Management is the term for the desired environment for a JFACC to operate C2 efforts to include providing the correct shooter with the appropriate information at the optimal time. Dominant battlespace awareness is a goal of advanced C4ISR improvements that will help meet the USAF goal of centralized control with decentralized execution of AO and other TMD and TCT efforts.[125] Additionally, in a joint venture with the Marine Corps, the USAF is developing a Combat Integration Center (CIC) for use specifically against mobile TBMs. This CIC and the JFACC Situational Awareness System (JSAS), which allows intelligence information to be easily

[123] William B. Scott, "Scud Missile Warning Time Cut to Seconds," *Aviation Week & Space Technology*, 23 February 1998, 108. The 11th SWS is part of the 21st Space Wing, Falcon AFB, Colorado. This one unit is specified in this treatment because Gen. Fogleman (in his "AF Role in TMD" speech cited) and this author considered the ALERT system extremely important to both BMC4I and the entire TMD architecture's functioning.

[124] Fogleman, "The Air Force Role in Theater Ballistic Missile Defense," remarks on 16 June 1995. Also, there is overlap of information with the with the XORFS, "USAF Roadmap for Theater Missile Defense Attack Operations."

viewed on a laptop computer, provide further joint C4I interoperability constructs. The objective of all these C4I efforts is "a flexible, seamless command and control system."[126]

Summary

TMD is obviously more complicated in the late twentieth century than V-1 site hunting was in WWII—and will continue to become yet more complicated as enemies obtain more technology to thwart preemptive attacks and defensive measures. However, many of the same intelligence, communication, intercept, and attack problems remain—but in a more time critical and lethal environment. This chapter discussed the current and near-term TBM threat, establishing the need for improved TMD in this time when strategic implications may lie in a single conventional or WMD armed missile. Second, the rationale for countering the TBM threat was discussed to establish the political and military reasoning process and some considerations. Linkages and cooperation between various governmental leaders, agencies, and the services was apparent. Next, current TMD options and abbreviated concepts of operations followed. USAF systems and concepts were examined in more detail, and doctrinal debates were introduced but avoided. Indeed, there is no dispute that a joint multi-layered approach is required for increased safety in a TBM environment.

The next chapter will evaluate the USAF options discussed in this chapter and present some missile defense and Anti-Missile Actions implications based on the analysis

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[125] ACC, *CAF CONOPS for TCT*, 1 and 19-22.

[126] Fogleman, "The Air Force Role in Theater Ballistic Missile Defense," remarks on 16 June 1995.

of various TMD and AO options. First selected near-term options are compared, then implications are drawn from the current theater missile and US TMD situations.

Chapter 4

TMD and Anti-Missile Qualitative Evaluation: Comparison and Analysis

If asked by Congress where I think we need to invest more of our theater Air and Missile Defense dollars, my generic answer is Attack Operations.

Lt. Gen. Lester Lyles
USAF Roadmap for Theater Missile Defense Attack Operations

The last chapter introduced the current TBM threat, the military and political rationale for defending against the threat, and acquainted the reader with the core and other primary weapons systems considered for joint TMD. This treatment certainly makes no dispute that a joint multi-layered approach is required for increased safety and political leverage in a TBM and WMD environment. However, this chapter will emphasize the USAF current and near-term approach to TMD and Anti-Missile Actions.

This chapter evaluates the USAF options discussed in Chapter 3 to distill four TMD and Anti-Missile implications. First, this chapter presents a brief comparison of the BMDO core weapons systems plus Attack Operations. The question examined is "what is the best way to solve the USAF Anti-TBM situation now?" The evaluation methodology used considers many factors described below. Some of the factors originated from Joint Publications, others in speeches and press releases, and still more derived through basic observation. Finally, implications of the strategic process choices are investigated, but no judgements or proposals are presented in this chapter. The next chapter will build on this

chapter's implications and construct proposals regarding the comparisons made in this chapter to answer the question proposed above.

Comparisons

Correctly mixing joint capabilities and balancing the four Joint Pub 3-01.5 TMD pillars, passive missile defense, active missile defense, Attack Operations and BMC4I is the goal of a synergistic approach to missile defense. This study concentrates on the last three pillars, but is most particularly interested in exploring pre-launch and post-launch Attack Operations for the near-term.[127] For planning, Joint Pub 3-01.5 notes that intelligence preparation of the battlespace (IPB), JTMD preparation and training, and operation planning, logistic requirements, and geographic considerations will impact early JTMD planning.[128] To extrapolate from those points, it is important to also consider range, cost, multi-mission capability, opportunity costs, environmental flexibility, limitations, joint environment functionality, and specific philosophical and systemic benefits and costs.

Current and near-term weapons systems and capabilities

The currently fielded systems available to provide joint TMD include a variety of BMC4I and other C2 assets, Attack Operations weapons platforms, and PAC-2. Eliminating the passive defense pillar from consideration and reducing the overlapping TMD concept to its components by phase, this leaves the examples of current and near-

[127] The boost or ascent phase ABL is planned for the mid-term, and any advanced technology weapons, airborne or space, would be operational beyond the timeframe upon which this thesis focuses.

term capabilities in Figure 3.[129] It is important to note that there is a tremendous near-term gap in US capabilities, an Anti-Missile Capabilities Gap, including the boost or ascent phase and the midcourse or trans-atmospheric phase. This places the US military in the uncomfortable position of having AO and some limited, single-mission terminal weapons systems as the only available Anti-Missile options for the near-term.

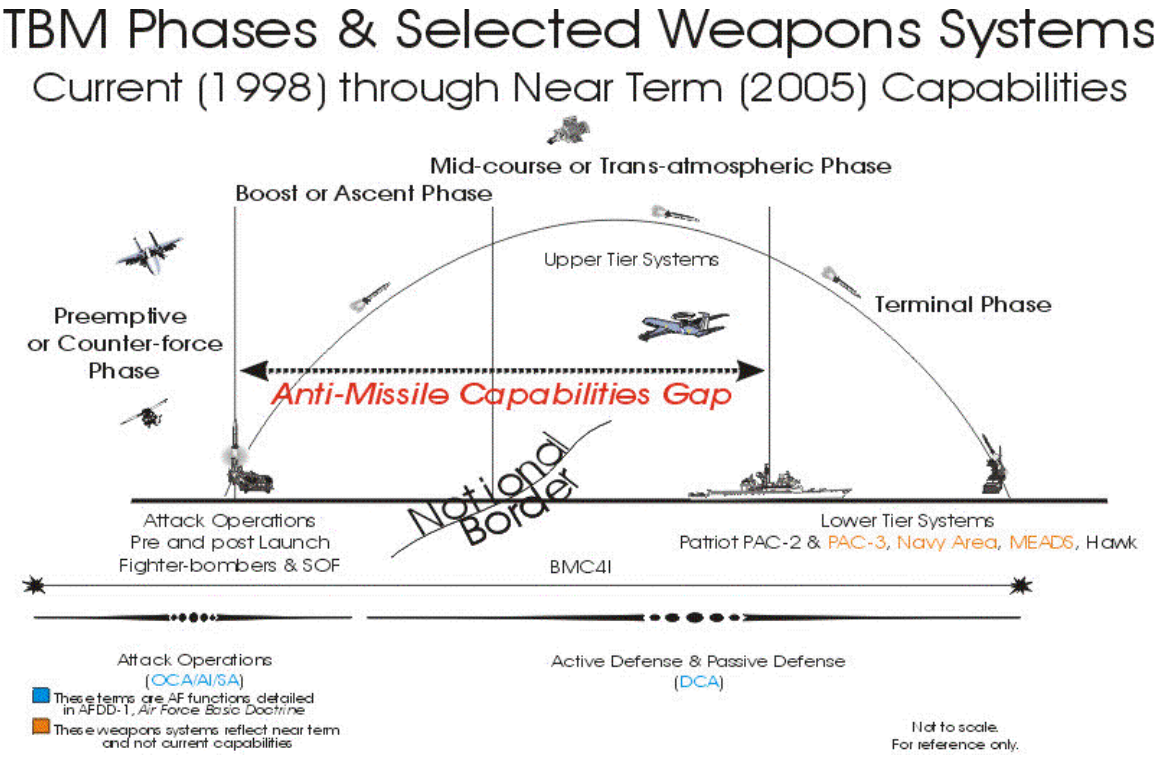

Figure 3. TBM Phases and Selected Weapons Systems information compiled from multiple sources.

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[128] Joint Pub 3-01.5, *Doctrine of Joint Theater Missile Defense*, 22 February 1996, III-1. The pillars are discussed throughout the text, however, they are briefly introduced on viii.

[129] The planned mid-term TMD architecture is included in the last chapter (in Figure 2). Current and near-term systems are included because many systems will remain appropriate JTMD options. However, the mid-term adds some ability to fill-in the "Anti-Missile Capabilities Gap" shown in the Figure 3. ABL, THAAD, and NTW assist in this objective—assuming all come on line and function adequately. This does not take into account deployment rates, utilization rates, availability for two major regional conflicts, etc.

Currently, the USAF retains a tremendous role in both the BMC4I and AO categories. As the PAC-2 is presently the point defense weapon of choice, there is no rapidly deployable (i.e., within 24 hours) and or area TMD active defense option. Therefore, currently and in the mid-term, AO remains an essential first layer of TMD, and AO may be the only layer of TMD for a time. Obviously, BMC4I is likewise required for its ability to locate the launchers, C2 nodes, and associated TBM equipment and contribute to tasking AO.[130]

To concentrate on what the USAF can do immediately and build upon in the near-term, based on the current plans and time frames reviewed in Chapter 3, it is necessary to consider several pros and cons of current and near-term systems. BMC4I will not be included in the matrix as it is both a BMDO and USAF priority in TMD. For without excellent BMC4I, the USAF is back to WWII CROSSBOW-like autonomous operations. With good BMC4I, improved Gulf War-style AO is possible. While good BMC4I may be able to achieve a fair number of post-launch TEL, interdiction, and strategic attack kills, superior BMC4I is required to achieve significant numbers of pre-launch kills.

Comparison of Near Term Systems

This section compares the expected TMD and USAF Anti-Missile systems to be available in the near-term. These systems include AO (both pre- and post-launch), Patriot, HAWK, and MEADS. AO is the only capability to attack missiles on the enemy side of the border, in the near-term, in the preemptive or counter-force phase. The other

[130] As well as provide warning for passive defense measures and point defense through the PAC-2 or 3.

current and near-term systems are terminal phase weapons, typically used in a point defense role. First a comparison is presented, then a summary rough comparison table follows (Table 2). The comparison criteria are listed as headers for brevity and ease of discussion, and are defined where necessary. All analysis is qualitative not quantitative.

Range

A key inherent limitation of the discussed point defense terminal systems stems from the fact that they are stationary and have limited range. AO, however, provides the ability to strike deep within an enemy country. This is particularly desirable when discussing WMD, since it is preferable to destroy potential devices as far from friendly troops or cities as possible. SOF involvement in AO may not have the range (or speed) of fighters. Likewise, fighters may not possess the unrefueled range of bombers. Nevertheless, the range of AO provides the distinct advantage of destroying enemy TBMs as far as possible from friendly locations.

Logistic Support

Logistical support for AO is potentially a long train. Though it may take time to resupply a terminal phase battery, keeping a relatively large flying unit operational requires substantially more personnel than a single point defense detachment. The trade-off of required support for area capability comes at a cost. The up-front logistics of airlifting a fully equipped PAC-3 unit is not trivial. However, a sustainable AO unit requires more in personnel supply, munitions, fuel, parts, et cetera, but provides considerably greater coverage.

Cost

Cost is a particularly difficult characteristic to assess. To quantitatively analyze cost, research and development through testing and deployment plus maintenance expenses would require examination. Additionally, manpower costs and deployment and sustainability issues remain. However, when qualitatively investigating the question of comparing the costs of preemptive or area systems to more limited point defense systems, it is possible to infer that per unit cost is less for AO.[131] This results from the degree to which an area suppression force influences enemy behavior, whether pre or post-launch. However, quantifying data from Desert Storm is not a reliable methodology since it is essentially a single data point. Therefore, basic cost is not rated for this evaluation for all systems.

Multi-Mission Capability

The multi-mission versus single mission question has plagued USAF planners since the Interwar period. In the recent F-22 and Joint Strike Fighter programs, however, the trend toward multi-mission capable platforms has reached its zenith. Likewise, AO and BMC4I offers overlap with all other USAF missions and many joint endeavors. For example, an F-15E package on a deep interdiction mission might be rerouted to attack a pop-up TEL before continuing on with the remainder of its pre-planned mission.[132] Another example is an F-16 package on an AO sortie is rerouted to provide close air support (CAS) for the Army. A final example is an E-3 AWACS controlling an air superiority battle simultaneously using off-board data to provide a B-2, launched from

[131] Based on footage covered versus price of coverage.

the CONUS, with updated AO information. The entire AO and BMC4I system within the USAF is multi-mission capable, some to a greater extent than others. This is a distinct advantage to point defense systems that are TMD only, or may require some configuration changes to convert to CMD or anti-aircraft defense. Bottom line: active defense systems have only one mission, to shoot things down, while multifaceted USAF AO and BMC4I systems are, by nature, multi-role.[133]

Opportunity Costs

The opportunity costs, costs assessed from the viewpoint of utility for multiple missions, is one area of consideration regarding AO that significantly separates USAF inputs, especially AO and BMC4I, from the terminal systems.[134] Due to the abundant overlapping programs in the Program Objectives Memorandum (POM), it is virtually impossible to separate and identify all Anti-Missile specific AO and BMC4I systems from the USAF budget. Nearly every fighter, bomber, electronic combat asset and platform, UAVs, space assets, the C2 network, and all associated manpower has possible linkage to the current joint TMD architecture and a future USAF Anti-Missile Offensive Actions paradigm. Single mission systems, such as the Patriot, though they may carry

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[132] Information acquired through a Defense Support Program (DSP) satellite, overhead asset, UAV, E-8 JSTARS, etceteras can locate use C2 links to provide rerouting.

[133] A similar comment was made during a JAOWG discussion on 5 February 1998 though the author and LTC Clay Chun discussed this very point at length on 3 December 1997, and on many occasions between October 1997 and 15 April 1998. Obviously it is not a new observation. But, the importance of multi-role weapons systems in a budget-constrained environment cannot be overemphasized.

[134] This opportunity cost also applies to the Upper Tier THAAD and NTW systems, which are anti-missile systems almost exclusively.

some strategic and tactical capability, possess no operational level capability, thus reducing their opportunity costs.[135]

Environmental Flexibility

All the DoD TMD systems have various levels of environmental flexibility, though weather and terrain may negatively affect effectiveness and TCT responses. Depending upon the specific system within the FoS, or the specific weapon to be employed by a platform in an AO function, the environment may create particular challenges. Airborne or space BMC4I systems may be somewhat affected by factors from solar storms to sandstorms. As BMC4I is affected, the potency of C2 for point defenses, AO, and SOF AO is degraded. Across the board, though environmental flexibility exists for TMD systems, different environmental factors must be planned for TMD operations.

Joint Environment Functionality

The ability to operate in a joint environment is critical to the BMDO FoS and the integration is one of the critical functions of JTAMDO. However, BMC4I is the overarching requirement that spans the services and affects international TMD and counter-proliferation cooperation.[136] The 1995 Roving Sands exercise was a recent example where multiple services engaged in TMD AO using BMC4I effectively. The 1997 Joint Project Optic Windmill-2 (JPOW-2), a combined and joint TMD assessment

[135] *Strategic level* capabilities include capabilities beyond the theater. For example, the combination of the Scud Hunt and Patriot deployment to Israel in the Gulf War had strategic implications by allowing Israel to avoid attacking Iraq directly. *Operational level* capabilities are theater wide, such as BMC4I or AO, which have the inherent flexibility to maneuver over great distances throughout a theater. *Tactical level* applies to a specified limited area, battle or battlefield. Point defense weapons, such as the PAC-3 or Hawk are certainly tactical weapons.

[136] For TBMs, cruise missiles, and WMD.

that involved the Dutch, German, and US forces, is another example.[137] Moreover, MEADS and ARROW are combined programs with international flavor. However, the ability for AO to easily incorporate Naval, Marine, and SOF forces is apparent. Operational AO and BMC4I Tests conducted with the 57th Test Group then the 53rd Test Group, in coordination with SPACECOM, since 1992, include joint applications.[138] Additionally, since the JROC and national political rhetoric advocates protecting allies with the US TMD FoS architecture, international and interservice interoperability, particularly with BMC4I and point defense systems is a BMDO priority.[139]

Limitations

Weather is a limitation that effects all TMD systems. Moreover, terrain may affect the efficiency of bomb-dropping AO. However, limited range is a significant limitation of all the point defense systems. The lower tier, by its nature as a last ditch defense, requires relatively close interception of TBMs. This presents critical concerns, political and military, when intercepting TBMs in a WMD environment. Currently, USAF BMC4I is particularly efficient at finding and executing AO to engage fixed TBM targets and post-

[137] Mark Hewish and Joris Janssen Lok, "Stopping the Scud Threat: Engaging Theater Ballistic Missiles on the Ground," *Jane's International Defense Review*, June 1997, 40-47. This article is a good overview of a variety of joint systems used in AO, including many BMC4I systems. Gen. Fogleman refers to this test in his "AF Role in TMD" speech cited earlier. Another source referencing this exercise with respect to interoperability issues is General Richard Davis' Special DoD News Media Briefing.

[138] Please see test reports regarding Goldpan and Gold Strike, among others, for more detail on interoperability and functionality issues. Tactics and concepts are also discussed in these tests. The 57th TG was at the Nellis Air Warfare Center then reorganized into the 53rd TG. Tests are still frequently flown at Nellis, but much of the test administration is now done at Eglin AFB.

[139] General Richard Davis, Special DoD News Media Briefing. A question was asked regarding the recent Taiwan Straits bill calling for an integrated TMD system, after a long debate in Congress on architecture, to be given to Taiwan for defense against

launch mobile targets. Pre-launch capabilities are limited. This does not greatly affect the Lower Tier systems because their function is limited to post-launch actions only. Interoperability issues remain and provide limitations across the board, but capabilities in this area will continue to progress through the near-term and mid-term. Finally, territorial use and overflight treaties may limit all ground-based systems and restrict areas from which AO may be launched. Likewise, if there is no ocean near a target area for AO or a friendly city or troop concentration for Navy Area, then the USN and Marine assets may be of limited utility.

Preparation and Training

BMC4I required extensive training to operate systems, but these systems are multi-use and overlap with other combat IPB and ISR requirements. AO requires additional training as datalink technology improves, but again, multi-mission capability allows general training to be easily incorporated into unit training programs. Single mission systems require dedicated personnel and training. The near-term Lower Tier systems, therefore, require that more specialized personnel be taken from other potential mission areas. Battle management concepts are developing, but the flexibility, the minimal preparation time, and the terrific overlap of training for USAF AO is implied in a final draft of BM CONOPS:

> The rapid development of systems such as the CIC and SOF will enable the warfighter to efficiently divert aircraft when it is necessary to attack TCTs. These systems will also give the BM the means to coordinate with the surface component C2 nodes for surface fires on TCTs. Thus, by 2003, the BM will have four procedures to combat the TCT problem: diverting airborne assets; using airborne CAP

Chinese TBMs. This TMD system would then, supposedly, reduce US military exposure to future Chinese-Taiwanese conflicts.

> assets; coordinating for surface fires on the target; and tracking the TCT to its hide site or resupply point.[140]

Operation Planning

AO and BMC4I both require some pre-mission planning. This may include planning to relocate C4I assets, programming specific weapons (when multi-mission weapons are not appropriate) for AO platforms, and theater-wide IPB familiarity for crews who might be required to operate across the enemy's full territory. Planning requirements, however, go hand-in-hand with training at a tactical or individual unit operational theater level. At the operational or strategic planning level, such as occurring with JFACC planning, once a basic strategy to task analysis is done, AO is reduced to a more commonly practiced BMC4I, OCA, AI, and SA effort. However, interoperability at the joint level is required—particularly for joint weapon engagement zones (JEZ) and rules of engagement for lower tier air defense systems over which air power platforms must operate.[141]

Deployment Speed

Most USAF AO and BMC4I systems are available for rapid deployment. With minimal airlift support when compared to a similarly capable ground force unit, air expeditionary forces (AEFs) can deploy within hours and are ready for nearly immediate retasking to combat operations.[142] If Lower Tier systems are not already in position,

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[140] J-8, *Battle Management Concept for Joint Theater Air and Missile Defense Operations,* Final DRAFT, September 1997, VI-12.

[141] Ibid., V-13. Many procedures and techniques also exist for integrating land defense and air offensive forces, such as wounded-bird procedures, radio-out procedures, identification friend or foe (IFF) procedures, etc. Many limitations exist, however, particularly in the IFF targeting practices. This document illustrated a good attempt at integrating joint BM concepts.

[142] AEFs can be also categorized as Air Expeditionary Wings (AEWs) or Air Expeditionary groups (AEGs). Various statements and reports make use of the different

numerous airlift sorties plus some set-up time is required to develop the catcher's mitt capability. An exception is Navy Area requires no airlift. Forward prepositioning of munitions and fuel, and/or agreements for landing and operating rights may hinder the deployment speed of AEFs. That does not diminish the availability of large aircraft or refueled aircraft long-range AO and ISR activities.

Political Geographic Considerations

The political situation may be a factor with maintaining an AO base. Recent limitations on employing air power out of Saudi Arabia during the February 1998 United Nations WMD inspection crisis with Iraq had the potential to hinder AO, while the overtly defensive posture retained by the Patriot was embraced. However, beyond political constraints, because of the inherent range limitations of the lower tier systems, defense of any large geographic area is currently impossible with lower tier systems. This detriment for the lower tier systems is again related to range and capability, plus the danger of detonating WMD overhead. Actual operational effectiveness and political perception are not always congruous assessments. Though AO (and BMC4I) can affect a greater area of operations, point systems may be less broadly capable but more politically satisfactory—perhaps early in a conflict. As discussed in the Army sponsored RAND study, *Strategic Exposure*:

> In near-term crises, southern European countries will almost certainly require deployment of ATBM and air defense assets on or around their territory (regardless of the effectiveness) in order to reassure parliaments and publics. Over the longer term, development and deployment of truly effective ATBM defenses—perhaps sea based and capable

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nomenclature. Wings would generally be larger than groups. Indeed, the air expeditionary strategy is meant to be flexible.

> of deployment around the Mediterranean—may be a prerequisite for NATO engagement outside Europe."[143]

Comparison of Near Term Systems Table

Continuing to define near-term as 2005 and using published expected FUE dates, it is possible to see that a few MEADS and Navy Area resources will be available to supplement PAC-3 and HAWKS. However, AO and BMC4I will remain the largest capability of the pillars beyond targeting missiles over friendly territory with terminal systems. For the comparison chart, Table 2, a "**+**" will indicate a pro of a system while a "**–**" will indicate a con for that system. A "**0**" indicates no clear advantage or disadvantage for a specific category. It is important to note that deployment of the THAAD, the ABL, and NTW is not anticipated before 2005.[144]

The categories presented include: range, logistic requirements, multi-mission capability, opportunity costs, environmental flexibility, limitations, joint environment functionality, preparation and training, and operation planning, deployment speed, and geographic considerations will impact early JTMD planning.[145] The triple-line down the center of the table represents the current and near-term Anti-Missile Capabilities Gap. This gap is significant because there is no currently available or planned boost/ascent phase and trans-atmospheric anti-missile capability in the near-term (please see Figure 3 for the Anti-Missile Capabilities Gap and Table 2 for the comparison of options).

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[143] Lesser, 27.

[144] BMDO Fact Sheet 97-05, *Ballistic Missile Defense—The Core Programs*, September 1997.

[145] Joint Pub 3-01.5, *Doctrine of Joint Theater Missile Defense*, 22 February 1996, III-1. The pillars are discussed throughout the text, however, they are briefly introduced on viii.

Table 2. Rough Comparison of Near-Term Joint TMD Systems

Categories	**Preemptive or Counter-force Phase**		**Terminal Phase**		
	AO Pre-launch	**AO Post-launch**	**Patriot**	**Hawk**	**MEADS**
Range	+	+	-	-	**0**
Logistic Support Required	-	-	-	-	-
Multi-Mission Capability	+	+	**0**	**0**	**0**
Opportunity Costs	+	+	-	-	-
Environmental Flexibility	+	+	+	+	+
Joint Environment Functionality	+	+	**0**	**0**	+
Limitations	**0**	+	-	-	-
Preparation and Training	+	+	-	-	-
Operation Planning	+	+	-	-	-
Deployment Speed	+	+	-	-	-
Political Geographic Considerations	+	+	-	-	-

Implications

BMDO is billed as the "single voice and the architect on the family of systems,"[146] and JTAMDO is tasked with integrating the joint systems. Though AO is frequently mentioned, a comprehensive and integrated improvement and effective current operations plan does not exist. Regional CINC's and other senior officers, particularly USAF leaders, recognize the value-added ability of AO combined with improved BMC4I, AO remains an under-advertised Air Force and air power capability. This portends continued limited funding toward advancing AO parallel to the core BMDO activities.

Frequently heard academic and Pentagon-hallway comments espouse the conventional wisdom that AO is ineffective and undependable, therefore more money should go to defensive systems. RAND studies and admissions by BMDO leaders suggest that AO is a very real necessity in any TMD FoS. Moreover, BMC4I is an enabler that makes current AO incredibly more effective than in WWII. With the increased interest in preemptive TBM attacks, the threat of WMD, and the limited protection afforded by point defensive systems, rapidly deployable AO will continue to increase in importance. In this era of reduced budgets, increased operational importance may not equate to significant increasing in R & D funding. Therefore, to improve the quality of AO to respond for the demand of the CINCs for integrated, improved CONOPS, and unique AO concepts are still required.

Another implication of the state of AO, principally as an AF program vice BMDO funded core program, is that training for AO missions will be required. Given the limited

capability of point systems and the need for multi-use AF platforms, the BMC4I sensor to shooter systems will require more training and continued exercises.

A final implication discussed in this treatment regards the doctrinal relationship of the USAF AFDD-1 core competencies and functions related to Joint Pub 3-01.5 and the accepted framework and definitions of TMD. The inherent conflict remains between the land component conceptualization of defense and USAF historical view of the nature of air power, that it is *best used offensively*. Though this conflict may not be resolved soon, a resolution of doctrinal issues in the near-term will facilitate all AO and BMC4I CONOPS.[147] There will be a choice to ignore joint versus USAF doctrinal inconsistencies (or friction) or a need to change one or the other.

Summary

This chapter examined the USAF options discussed in Chapter 3 and distilled certain TMD implications. The advantages of AO and its interface with BMC4I shows the critical importance of the role of the USAF in providing AO to help reduce the impact of the near-term TMD gap. Building on Chapter 2's evidence of the necessity for AO to reduce TBM attacks and inhibit much of the destructive threat of WMD before it reaches a friendly border and Chapter 3's detailing of the FoS and various service inputs, this chapter compared the more obvious near-term TMD possibilities. The implications presented in a lixiviated form include:

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[146] Davis, Special DoD News Media Briefing.

[147] Air Land Sea Application Center, *JTMTD Multi Service Procedures for Joint Threat Missile Target Development*, First Draft, December 1997; ACC, *Concept of Operations for Command and Control in Cruise missile Defense*, DRAFT, August 1996; the ACC, *CAF CONOPS for TCT*; and the J-8, *BM Concept for Joint Theater Air and*

1. Funding for AO specific improvements will remain limited resulting in the need for multi-mission weapons systems.

2. The importance of having an effective, flexible, and exceedingly deployable Anti-Missile option will increase as the threat, particularly the WMD threat, proliferates.

3. Training for AO and joint BMC4I interface is required.

4. Doctrinal friction between land force concepts of defense and the USAF nature of offensive airpower will continue.

Chapter 5 will build on these rarified implications and present proposals regarding the comparisons made in this chapter answering the question, "what is the best way to solve the USAF Anti-Missile situation now?" Options are presented in the next chapter as alternatives or cost effective near and mid-term solutions to current USAF budgetary and technical constraints in response to the presented implications.

Missile Defense Operations, all reflect approaches toward facilitating and integrating CONOPS.

Chapter 5

Proposals and Conclusions

> *The key goal for warfighters is to attack WMD facilities in a controlled fashion and WMD-carrying missiles before they reach friendly territory.*
>
> *Barbara Starr*
> *Countering Weapons of Mass Destruction: US Concepts Target Counterforce Mission*

The last chapter examined the USAF options discussed in Chapter 3, distilling four implications of the present and near-term TMD and Anti-Missile situation. The advantages of AO and its interface with BMC4I shows the critical importance of the role of the USAF in providing AO to help reduce the impact of the near-term Anti-Missile Capabilities gap. While building on Chapter 2's historical evidence of the necessity for AO to reduce US TBM/WMD vulnerability, Chapter 3's justification for TMD and detailing of the BMDO FoS, and Chapter 4's comparisons, this final chapter will address the implications of the TMD and Anti-Missile situation through proposals intended to enhance USAF air and space power effectiveness and ultimately national defense.

Chapter 5 expounds upon the previously presented implications and volunteers proposals erected upon the framework of the comparison and analysis made in the last chapter. The goal of this chapter is to finally answer the question: "What strategic approach *should* the USAF take toward TMD and Anti-Missile Offensive Actions in the near-term?" This chapter presents the non-prioritized implications given in Chapter 4

followed by proposals generated to positively influence the implications. Options, generated by the author, are presented in this chapter as alternatives or cost effective near and mid-term solutions to reduce the impact of the gap in the current and near-term US TMD architecture. Additionally, some significant Pros and Cons of each proposal are presented in a table after each proposal is discussed.

Implications of Current TMD Situation Reviewed

Below is a restatement of the compressed implications made from the analysis in Chapter 4:

5. Funding for AO specific improvements will remain limited resulting in the need for multi-mission weapons systems.
6. The importance of having an effective, flexible, and exceedingly deployable Anti-Missile option will increase as the threat, particularly the WMD threat, proliferates.
7. Training for AO and joint BMC4I interface is required.
8. Doctrinal friction between land force concepts of defense and the USAF nature of offensive airpower will continue.

This chapter incorporates these implications into the proposal presentation and analysis of each proposal's Pros and Cons. The format of the next sections include a presentation of each proposal, justification for or the author's rationale behind each proposal, and a tabular presentation of the Pros and Cons for each proposal and their direct relationship to each implication from Chapter 4. Conclusions complete the chapter.

USAF Near-Term TMD Proposal 1

Establish an Anti-Missile/WMD AO AEG capability.

Justification for Proposal 1: AO AEG

Attack Operations Air Expeditionary Groups could be an amalgamation of assets that are capable of multiple missions, but with additional training or specialization with the Anti-Missile Offensive mission.[148] Possibly, certain AF Guard and Reserve units could be restructured in a limited fashion to facilitate this concept. In any case, specific active duty and AF Reserve or Guard units could be designated as having a primary or secondary TMD AO mission. In the past, fighter units often had a 60%/40% air-to-ground/air-to-air mission split, for example. Guard/Reserve should practice some single mission and assist in constructing these AEGs, e.g., UAV or info ops, or SEAD trained F-16s. Preferably, specific units, active duty or not, could be designated as having a TMD additional duty just as certain units now have Maverick tasking while others have AGM-130 tasking. Appropriate training events would be constructed.

A rough example of the primary platforms or assets that a near-term AO AEG might contain could include:

- 6 x F-15E for AO (Back-up AI, SA, and Air Superiority)
- 6 x F-16CJs for SEAD and AO (Back-up AI, SA, and Air Superiority)
- 6 x F-15C for Air Superiority
- 3 KC-135s or KC-10s
- 2 x E-8
- 2 x AWACS
- UAV detachment

[148] The AEW Battlelab at Mountain Home AFB, Idaho, could address organizational issues and configuration decisions of an AO AEG to refine the basic concept set forth in this treatment.

- Space/info ops detachment
- Appropriate Intelligence/Communications and other BMC4I assets[149]

An AO AEG could deploy and be ready to fight very rapidly. The smaller size of an AEG might be more palatable than full Wing deployment in a sensitive political climate. Less ramp space would be required than for full wing, and the size of the TMD AEG could be tailored to fit not only to the situation but also to the political constraints of a situation. Moreover, as the first AEG deployed in a TBM threat environment, the AO AEG could shift mission priorities later if the situation changes or a crisis expands. Additionally, the 0-6 level of command for group operations may also be easier and less diplomatically controversial than mobilizing a General Officer and a full AEW.

By training together, an AEG—multi-role but tailored for a specific mission of AO—would have increased capabilities. Particularly as BMC4I is exercised in the field during peacetime and space, UAV, and other ISR and C2 elements integrate with weapons employers. Joint assets in theater could operate with established CONOPS when working with the AEG. Current USAF doctrine in AFDD-1 would not be in conflict with the tailored AEG concept. Joint Pub 3-01.5 would not be violated in letter or spirit. The increased anti-TBM capabilities and the multi-role options if a conflict expanded, allowing a flexible AO oriented AEG to fold into a conventional AEW, are in line with

[149] Appropriate BMC4I and administration, maintenance, and other combat elements would also deploy, and the ABL, once operational, can easily fold into this concept. This list is not meant to be exclusive, just a rough-cut of capabilities for an example. A much smaller AEG could be formed as required for the political and military situation. Additionally, Cobra Ball, Rivet Joint, ABCCC, etc. could be attached to an AO AEG or AEW.

the USAF core competencies.[150] The essence of the defensive political posturing of the AO AEG would be its offensive power, creating a capable deterrent to TBM launches. However, an AEG's ability to strike immediately against an aggressor, if deterrence fails, is crucial to success in both diplomatic and military arenas.

[150] AFDD-1, 28. These competencies include Rapid Global Mobility, Precision Engagement, Global Attack, Air and Space Superiority, Information Superiority, and Agile Combat Support.

Pros/Cons of Proposal 1: Establish an Anti-Missile/WMD AO AEG Capability

Table 3. Pros/Cons of Proposal 1: Establish an Anti-Missile/WMD AO AEG

Implication	Pros of AO AEG	Cons of AO AEG
Limited funding requires the need for multi-role capability.	• Established AEG and AEW capability. • Full multi-role capability. • Funding is available for BMC4I improvements through BMDO that will help AO AEG. • Incorporating Air Guard and Reserves could reduce ops tempo and increase capability for similar funding.	• Integration funding may not be readily available. • Misperception of AO AEG as a separate unit and not able to fold into an AEW when required.
The importance of having an effective, flexible, and exceedingly deployable Anti-Missile option will increase as the threat, particularly the WMD threat, proliferates.	• AEG is capable of rapid deployment. • With training and BMC4I integration, effectiveness will increase. • AEG provides additional joint AO option. • Passive defense can easily be incorporated with AEG.	• Deterrent effectiveness is dependent upon a coordinated diplomatic/political/information effort. • Superior destruction potential requires effective ISR and BMC4I. • AO will require some active defense at some time in a high threat environment.
Training for AO and joint BMC4I interface is required	• Established (and improving) AO training and tactics exist. • Training can dovetail with current Red Flag, Green Flag, and other exercises. • Unit level training can be supplemented by training with units together (e.g., short TDY trips for E-8 JSTARS to operate with an F-15E unit on an AO practice session).	• Additional training may require additional funding.
Doctrinal friction between land force concepts of defense and the USAF nature of offensive airpower will continue.	• N/A	• N/A

USAF Near-Term TMD Proposal 2

Establish a single USAF leader for oversight of all Anti-Missile /WMD force planning, programming, and integrating—a USAF Anti-Missile Czar.

Justification for Proposal 2: Establish a USAF TMD Czar

Currently, there are at least two lead joint organizations tasked with TMD duties: BMDO and JTAMDO. Additionally, AF/XORFS conducts AO and ABL oversight. XP and the SAF directorates also participate in TMD procurement and strategy discussions. XORFS program managers interact with the JAOWG and other teams and working groups regarding AO, ABL, and BMC4I. Currently, the JAOWG is lead by a civilian BMDO representative and a joint staff Marine colonel—but the USAF provides a preponderance of current BMC4I and AO assets and technologies. Other agencies manage different components of the USAF BMC4I architecture. Still more directorates construct CONOPS and doctrine, both USAF and joint. The CINCs submit requirements to the Joint Staff and service chiefs. Unfortunately, there is no single senior USAF leader who organizes, trains, equips, oversees or coordinates the *entire* USAF TMD Plan—or Anti-Missile Plan—from acquisition to employment.

A single leader of general officer grade would have the capacity to weave USAF Anti-Missile concepts more completely into the planned TMD architecture. Additionally, a senior leader would be better able to incorporate the "Halt Phase" concepts and AO for the near-term.[151] Moreover, a single point of contact or office to field USAF Anti-Missile issues would help in doctrine and funding disagreements with other services.

[151] Major General Charles D. Link proposed the USAF role in halting an enemy advance as the "Halt Phase," in 1997. Lieutenant Colonel Jim Riggins, HQ AF

Pros/Cons of Proposal 2: Establish a USAF Anti-Missile Czar

Table 4. Pros/Cons of Proposal 2: Establish a USAF Anti-Missile Czar

Implication	Pros of a USAF TMD Czar	Cons of a USAF TMD Czar
Limited funding requires the need for multi-role capability.	• A single USAF TMD leader will be able to better present unified USAF TMD concepts in efforts to gain funding. • Can coordinate with the entire USAF regarding force structure and employment issues to ensure continuity.	• Additional duty and requirement for a general officer. • Structural organizational changes must not allow increased bureaucracy.
The importance of having an effective, flexible, and exceedingly deployable Anti-Missile option will increase as the threat, particularly the WMD threat, proliferates.	• A single leader will not enable better immediate employment but will allow easier coordination for field commanders because of better integration and systems effectiveness.	• N/A
Training for AO and joint BMC4I interface is required	• USAF testing and exercises could be integrated for AO and BMC4I more easily.	• N/A
Doctrinal friction between land force concepts of defense and the USAF nature of offensive airpower will continue.	• A single voice coordinating USAF TMD efforts can only help articulate the USAF philosophy on the employment of airpower.	• N/A

XO/XOOC, Checkmate, discussed the Halt Phase from a strategy perspective in a briefing entitled, "Perspectives on the 'Halt Phase'," 14 January 1998. An essential element of the Halt Phase is to gain air, space, and information superiority to protect forces and enhance further operations. The Halt Phase involves considerably more than simply killing armor.

USAF Near-Term TMD Proposal 3

Continuing with all layers of the multi-layered joint TMD plan, the USAF should emphasize improving and employing AO in the near-term.

Justification for Proposal 3: Emphasize Improving and Employing AO

Chapters 3 and 4 of this treatment are replete with reasons to pursue USAF AO to counter enemy missile and WMD capabilities. However, there are a few simple reasons that build upon one another to establish a logic train for the USAF to pursue the strategic decision of AO emphasis and improvement. First, the basic USAF AO philosophy, aircraft (or Special Forces teams) striking enemy TBM facilities and C2 nodes, overlaps several existing USAF doctrinal functions, in line with the USAF core competencies. Second, AO is currently the *sole* Joint DoD or USAF option to apply the military instrument of power to destroy enemy TBM capabilities. This also applies for the near-term and mid-term. Third, the USAF has a long history of AO and operators currently are familiar with many of the techniques and procedures required to effectively employ AO. Finally, given the existing requirement, operational capability, and political will to establish effective TMD and counter WMD, improving and employing AO, emphasizing offensive Anti-Missile Actions, is the logical step for the USAF to pursue in the near-term.[152]

[152] Datalink test, such as Goldpan and Gold Strike, required AXQ pods on F-15E fighters for datalink capabilities. Link 16 is planned for joint use. Some funds are obviously allocated. There may be overlap, but AO can proceed even without new equipment—reliance on older methodology may be required. Older methods, such as retasking via secure radio or "in the clear" with codewords, remain effective. With current USAF AO and BMC4I capabilities and near-term planned improvements, a credible AO force is possible. It is available in conjunction with the normal OCA, AI, and SA operations capability resident in current operational units.

Pros/Cons of Proposal 3: Emphasize Improving and Employing AO

Table 5. Pros/Cons of Proposal 3: Emphasize Improving and Employing AO

Implication	Pros of Emphasizing Improving and Employing AO	Cons of Emphasizing Improving/Employing AO
Limited funding requires the need for multi-role capability.	• All AO assets have a multi-mission capability as evidenced by the fact that AO incorporates the function areas of OCA, AI, and SA. • The same assets that conduct AO can conduct other missions, sometimes on the same sortie. • Current and planned near-term munitions will be effective for the AO and AO for WMD specific missions.	• To improve AO, beyond the funding for BMC4I, additional money and manpower is required to provide rapid and significant increases in ability. • Speeding deployment of new weapons systems is required to provide better all weather AO capabilities.
The importance of having an effective, flexible, and exceedingly deployable Anti-Missile option will increase as the threat, particularly the WMD threat, proliferates.	• AO is both rapidly deployable and effective. • The TBM/WMD threat is increasing and AO is the only consistent across border anti-missile capability we possess. • With training and BMC4I integration, effectiveness will increase. • AEG provides additional joint AO option. • Passive defense can easily be incorporated with AEG.	• AO is not 100% effective. • Preemption may be perceived as inflammatory. • Post-launch counter-force requires absorbing a first strike.
Training for AO and joint BMC4I interface is required	• Established (and improving) AO training and tactics exist. • Training can dovetail with current exercises. • Unit level training can be supplemented by training with units.	• Additional training may require additional funding, particularly if additional equipment is required.
Doctrinal friction between land force concepts of defense and the USAF nature of offensive airpower will continue.	• N/A	• N/A

USAF Near-Term TMD Proposal 4:

Change joint doctrine to reflect that AO is typically a Counterair OCA mission with occasional excursions into AI and SA. This may include the overarching concept that Anti-Missile Actions are more than TMD; they include offensive, defensive, and BMC4I activities.

Justification for Proposal 4: Change Joint Doctrine

AO is not a defensive activity. Regardless of the emphasis given to AO by Joint Pub 3-01.5, the nature of air power is offensive, and attacking enemy assets in the enemy's territory, whether before or after launch, is inherently offensive. Moreover, when dealing with WMD, the threat of "defense" is not a deterrent. Strategically, offensive capability is the basis of deterrence. Therefore, AO provides both deterrent and destruction capability. Additionally, using current USAF doctrine, OCA, AI, and SA can contribute as adjuncts to the AO concept with both direct and indirect attacks causing strategic results attributable to effects-based targeting.

According to the new Air Force Doctrine Document 1, published in September 1997:

> Because air and space forces are inherently offensive and yield the best effect when so employed, **OCA** is often the most effective and efficient method for achieving the appropriate degree of air superiority. This function consists of operations to destroy, neutralize, *disrupt or limit enemy air and missile power as close to its source as possible and at a time and place of our choosing*...The attack aircraft and missile threat may include fixed- and rotary-wing attack aircraft, reconnaissance aircraft, unmanned aerial vehicles, air-, land-, and sea-launched *cruise missiles, ballistic missiles*, and air-to surface missiles.[153]

[153] AFDD-1, 46-47. Therefore, Anti-Missile AO may be more like SEAD than DCA. The XORFS AO Roadmap parallels this point of view.

General Fogleman further articulated the AO concept thereby demonstrating the offensive nature of the activity:

> Pre-emptive precision strikes against point targets and application of denial weapons will greatly hinder near-term enemy TBM activity. Meanwhile, lethal precision attacks against the TBM support tail will undercut the enemy's ability to sustain long-term ballistic missile operations…If the enemy succeeds in launching a mobile TBM, detection of the launch event will key our Attack Operations. We will capitalize on the inputs from overhead and surface sensors, special operations forces, JSTARS, AWACS, Rivet Joint aircraft, U-2s and unmanned aerial vehicles—UAVs. Those inputs will identify the launch point and cue Air Force and other service assets for time-critical strikes on the enemy TEL.[154]

Indeed, the nature of air power is the offensive and the nature of AO is offensive. By resolving the disconnect between BMDO and Joint terminology, particularly the impact of Army influence in the TMD conceptualization, airmen will be better able to understand how their AO missions are part of not only an air campaign but an entire battle plan.

As the Air and Space Basic Course (ASBC) is growing a new generation of USAF officer with a common baseline, increasing the influence of USAF doctrine in joint TMD efforts will pay great benefits across the board.[155] These benefits will include an internalized USAF concept of air operations, increased AO awareness in the near-term and increased Hill-visibility with better operational capability for USAF AO and BMC4I. Increased visibility benefits the political/diplomatic instrument of power by allowing counter-proliferation or other negotiations to commence from a position of strength. This visibility could also lead to increased funding, which would improve the entire system.

[154] Fogleman, "The Air Force Role in Theater Ballistic Missile Defense."
[155] The ASBC is currently undergoing initial testing at Maxwell AFB, Alabama.

Increased AO capabilities could more effectively preempt missile attacks to help prevent catcher's mitt systems from being saturated by salvo TBM (or cruise missile) attacks. Moreover, pre and post launch AO could provide the JFACC with the multi-mission synergy produced by effects-based targeting vice a destruction only approach.

Perhaps a better configuration for a future "Joint Anti-Theater Missile Doctrine" publication would include a strawman similar to Figure 4. BMC4I is the foundation upon which *ALL* Joint Anti-Missile and Anti-WMD activities are built. "Offensive" and "Defensive" actions produce cooperative and Joint (or combined) "Anti-Missile Actions."[156]

The Offense pillar includes flight and SOF AO, and possibly would incorporate future space and informational operations. The Defense pillar would include activities that occur on the friendly side of the border, or in relation to TMD upper-tier and lower-tier weapons systems and passive defense. The Defense pillar, therefore, incorporates the majority of the BMDO systems minus their particular BMC4I efforts. No organizational power would be lost, but offense-defense balance and the proper place for BMC4I would be conceptually valid and consistent. Additionally, the term "Actions" refers to fires, air attacks, and effects-based targeting leading to a possible systemic collapse of an enemy's TBM capabilities.

[156] The ground force term, "fires," was intentionally not used. That lexicon leaves no room for AO that involve space or information operations that can produce AO effects but may not involve actual "fires." Actions may incorporate fires and other current or future joint attacks that may be direct, indirect, lethal, or non-lethal.

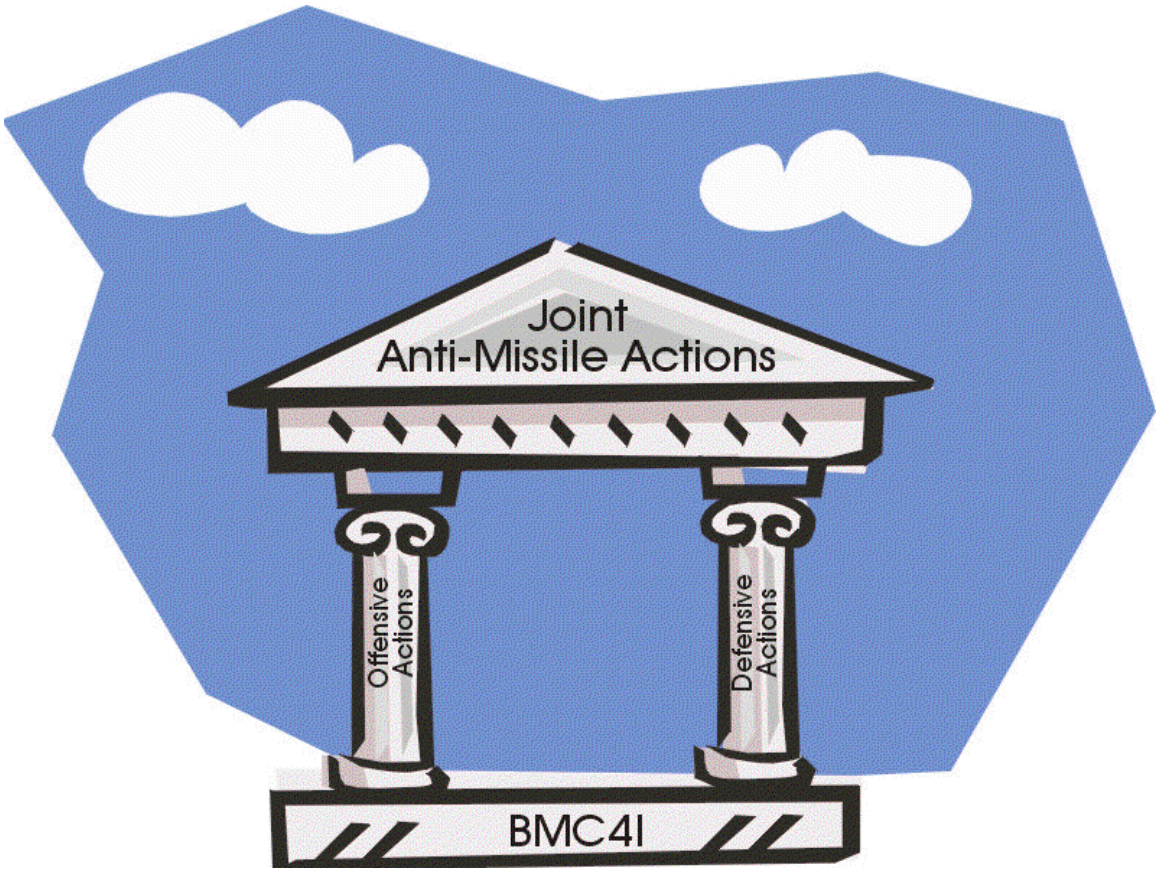

Figure 4. Proposed Simplified Joint Anti-Missile Concept

Pros/Cons of Proposal 4: Change Joint Doctrine

Table 6. Pros/Cons of Proposal 4: Change Joint Doctrine

Implication	Pros of Changing Joint Doctrine	Cons of Changing Joint Doctrine
Limited funding requires the need for multi-role capability.	• Doctrine is linked to perceptions, and perceptions are certainly linked to funding. Therefore, increasing the perceived USAF AO contribution may lead to increased funding—which then leads ultimately toward better and more capable US military anti-missile efforts.	• Long, hard fight. • Entrenched Army and Navy influence in the current iteration of JP 3-01.5.
The importance of having an effective, flexible, and exceedingly deployable Anti-Missile option will increase as the threat, particularly the WMD threat, proliferates.	• Consistent doctrine provides both a baseline and a point of departure for rapid and effective operations. • Easier for JFACC to rapidly organize and administer air defense. • A unified front of anti-missile military action is more productive than a broad-brush, defensive posture.	• N/A
Training for AO and joint BMC4I interface is required	• Re-engaging doctrinal discussions reinvigorates training, making better use of time and resources. • Easier for JFACC to organize and administer air defense.	• N/A
Doctrinal friction between land force concepts of defense and the USAF nature of offensive airpower will continue.	• Encouraging doctrine discussions leads doctrine from dogma to functional, useful doctrine. • Doctrine should evolve with capabilities. • As AO and BMC4I are the only offensive anti-missile capabilities, current doctrine should be reevaluated.	• Possible perceptions of “rice-bowl” fights for funding. • Threat of overselling AO—it is not 100% effective, like all military operations.

Summary

The goal of this thesis was to investigate the question: "What strategic approach *should* the USAF take toward TMD and Anti-Missile Offensive Actions in the near-term?" As a result, this chapter presented proposals to address the implications derived from the situation analysis in chapter 4. Hopefully, these proposals will generate some discussion to advance USAF anti-ballistic and anti-cruise missile programs. In fact, such discussions may find that separating anti-missile programs from TCT concepts is not tenable. Moreover, integration of all elements of BMC4I, including information and space operations, should be included in any USAF future paradigm. Briefly, the four proposals presented in this treatment include:

1. Establish an Anti-Missile/WMD AO AEG capability.
2. Establish a single USAF leader for oversight of all Anti-Missile/WMD force planning, programming, and integrating—a USAF Anti-Missile Czar.
3. Continuing with all layers of the multi-layered joint TMD plan, the USAF should emphasize improving and employing AO in the near-term.
4. Change joint doctrine to reflect that AO is typically a Counterair OCA mission with excursions into AI and SA. This should include the overarching concept that Anti-Missile Actions (AMA) are more than TMD; AMA include offensive actions, defensive actions, and BMC4I activities.

Conclusion

Theater missile and WMD proliferation creates a new set of challenges for the USAF in this multipolar, post-Cold War world. With the help of Revolution in Military Affairs systems contributing to close the time loop between the sensor and the shooter, the near-term reinvigoration of USAF Attack Operations and associated BMC4I elements is

possible.[157] Once improved, AO and BMC4I will effectively project national will and combat power while protecting our troops and allies with a strong offensive capability in a variety of situations.

Unfortunately, dogmatically written joint doctrine may negatively affect perceptions, funding, and the opportunity for the USAF to contribute to the Anti-Missile effort. The implications and proposals humbly submitted in this treatment are a view from the outside of an extremely complicated series of capabilities, roles and missions, and doctrinal debates. Overall, this thesis recommends that USAF near-term Attack Operations (AO) and BMC4I integration should be considered as part of a greater air and space power Anti-Missile Offensive Counterair effort, not simply an adjunct to a surface-force-centric TMD paradigm. In the opinion of this observer, who has participated in USAF Anti-Missile Attack Operations in war, training, and operational test, increased attention to air and space power Anti-Missile Offensive Actions will most assuredly yield an enhanced capability to defend US national interests on a grand strategic scale.

[157] Andrew F. Krepenevich, Executive Director, Center for Strategic and Budgetary Assessments, interview, 11 February 1998. Dr. Krepenevich said that, in his opinion, senior military officers were underused in policy debates and there is a program-budget mismatch that was not resolved in the Quadrennial Defense Review (QDR). AO may be part of this assessment considering the limited number of USAF AO experienced operators involved with BMDO AO activities.

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